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Heat Treatment Well Grounded in Experience But Not Yet a Science

BY JOSEPH R. MILLER*

UNDENIABLY, the earlier applications of heat treatment to metals were developed through trial and error. While it may seem from a review of the exactly formulated methods now followed in routine heat treatments that a scientific basis had been reached for the explanation and prediction of the results of heating and cooling the metals, especially steels, upon their structure and properties, the fact remains that our formulations are based upon much experimentation and upon little exact science or mathematical theory. Until we know more clearly the mechanics underlying the constitution of matter, particularly the thermal principles, we shall hardly reach a strictly scientific basis for any operations that deal with those mechanics so directly as do the operations in heat treating.

Case Similar to Colored Glazes in Ceramics

BESIDES, the finer touches of real artisanship apply in many special treatments, as in the case of tool steels and special new steels, and on larger masses and complicated shapes in the more ordinary steels as well. The case is similar to that in the production of colored decorations and glazes in ceramics which present-day science is able, through chemistry, to duplicate in a definite quality. But how shall we ever again attain the matchless beauty of the glazes and enamels of Kang Hsi or Chein Lung, for these were the products of the clever craftsman favored by friendly hills where he selected his materials. Shall we ever know those mixes?

As did this ancient artificer in the porcelains, so the heat treater, in spite of his superior sources of information, must refer to the "log" book of his trade and see what has been done on similar work in the past, improve the method as he can, and, above all, keep a careful record of both his work and its results for future reference. He can trust best his own experience. He cannot, without experience, predict or formulate a process. He cannot, without reserve, use the experience of another. This, of course, does not refer to routine treatments that are well worked out, for almost anyone can do these; they are neither art nor science, but simply formulas to follow.

Rate of Cooling a Vital Factor

WHILE we know some of the essentials of the theory of the reorganization of metal structures when heated and cooled, knowledge of the subject is broadening. From a large amount of experimentation it seems now to be fairly well determined that the point at which transformation in the metal (steel) structure takes place is determined by the rate of cooling. It is not a fixed point.

Also, it is indicated that certain microstructures heretofore thought to represent definite states of the metal are in reality different simply in fineness of structure; that is, if enough steps are taken in producing the differences, the change is a gradual one from a coarse to a fine structure of the same characteristics.

Thus on the one hand a troublesome variable is introduced in the process, while on the other we are taught to study more carefully our technique in the use of the microscope. These two developments are merely an indication of others on the way. Better than ever do we recognize the incompleteness of our present information. The facts that we need to know are very imperfectly understood, and it may be a long time before they are understood.

The limitations that surround the treatments of large masses are particularly a hardship to the heat treater. Experimentation on pieces of large size is expensive. Also costly work may be destroyed by wrong treatments and for these reasons progress is slow and results are not broadly published. Those in metallurgical charge of such work are wary in its doing and wary in what they say about it. Each approaches a new job with his records of former work before him and deviates as little as possible from what he has known to be successful on the nearest similar job. The successful conduct of such heat treatments is an art of the highest order.

X-Ray a Decided Aid

AN additional aid to the heat treater is the X-ray, for with it we may sift out and observe a little more clearly the ultimate structure that is being transformed. This seems, so far, to have best application to treatments in connection with cold working, which at present give rise to some uncertainties. Just how much those uncertainties are due to heat treatments and how much they may be due to imperfections and variations of the steel itself is more difficult to determine than in similar complications with larger pieces not cold worked. However, it is certain that the field of adaptation of heat treatments and cold working properly combined for superior results has hardly been explored beyond the range of wire sizes.

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Heat Treating Aluminum Alloys

Recent Progress Has Been Rapid—Views on Theory of Quenching and Aging—Uses of Heat-Treated Aluminum and Alloys

BY ROBERT J. ANDERSON, D. SC.*

HEAT-TREATMENT processes in the aluminum field may be classified broadly as follows:

1.—Annealing wrought aluminum and aluminum alloy manufactures for the purpose of softening, thereby permitting further cold work.

2.—Heating aluminum alloy castings to relieve internal strains, improve machinability, cause accelerated aging, confer permanent growth, or promote spheroidization. Heating is also applied in certain processes devised to stop leaks in castings or to improve resistance to corrosion.

3.—Quenching cast and wrought alloys after soaking at suitable temperatures to confer hardening power.

4.—Aging cast and wrought alloys for the purpose of hardening and strengthening after quenching.

Sound theory to explain the mechanism of the hardening of light aluminum alloys by quenching followed by aging had been developed by 1921. The chief difficulties of practice had been considerably overcome by 1925. In the past few years, however, much has been learned about both the theory and practice of aluminum alloy heat treatment, and recent progress has been quite noteworthy. The precipitation theory has been corroborated by ample experimental evidence. New alloys have been developed, based on metallographic study of the constitution of aluminum alloy systems. Refinements in practice have come with the application of rigid technical control and the improvement of appliances for heat treating. Moreover, valuable experience has been gained in handling a wide diversity of manufactures in production. Finally, marked increase in the uses of heat-treated aluminum alloy parts in a wide variety of fields has attended the developments just mentioned.

Theory of Quenching and Aging Heat Treatment

HEAT treatment of aluminum alloys is based on technical phenomena which are common to alloys in general. It is interesting to point out, in passing, however, that the mechanism of the aging effect was first elucidated for aluminum alloys only about 10 years ago and subsequently applied to other alloys. The present generally accepted theory which explains the hardening and strengthening of aluminum alloys on quenching followed by aging may be briefly summed up as follows:

(1) The alloying constituents which cause hardening from solid solutions with aluminum; (2) the solid solubility increases markedly with increase in temperature; and (3) the hardening is caused on aging by the precipitation of the dissolved substance in minute particles.

The aging may be carried out at the ordinary temperature or some moderately elevated temperature may be necessary.

The aging effect in quenched alloys is not an unusual phenomenon, but it is always observable in alloys which possess a transformation or a eutectoid change, or in which the solid solubility of one constituent (the solute) in another (the solvent) is increased considerably by raising the temperature. Precipitation on aging is accompanied by increase in strength, elastic limit, and hardness, and precipitation is the cause of these and other changes. Several theories have been advanced to explain why precipitation should cause hardening and other changes, but these cannot be taken up here.

Precipitation Involves Two Processes

Very recent work by Gayler and Preston indicates that precipitation from solid solution entails two processes:

(1) Rejection of the atoms of the dissolved metal from the lattice of the solid solution, accompanied by the possible formation of molecules, and (2) coagulation of the rejected atoms or molecules.

These two processes probably overlap. These investigators also find that the parameter of quenched-and-aged duralumin is measurably less than that of the annealed and slowly cooled alloy (which latter is the same as that of aluminum). In other words, the solution of copper in aluminum is attended by a (small) contraction of the aluminum lattice. That this lattice disturbance occurs on precipitation is shown by the broadening of the lines of the X-ray spectrum. Hardness is therefore said to be due to distortion of the matrix by the precipitation of highly dispersed particles. Maximum hardness has previously been ascribed to a critical dispersion of the precipitated particles.

The solid solubility of many metals in aluminum as affected by temperature has been thoroughly investigated, and the information made available by recent research has been of inestimable value in the development of alloys and in better understanding of the heat-treating processes. The application of dilatometry to the study of aging has been receiving considerable attention recently.

Annealing Governed by Certain Principles

PRINCIPLES governing the annealing of cold-worked aluminum and aluminum alloys are the same as those applying to metals in general. The object of annealing cold-worked metal is ordinarily to effect softening so that the material may be subjected to further deformation. Thus, commercial aluminum is furnished in the form of dead-soft circles for utensil drawing and as sheet and coil for forming and stamping. The demands of consumers for aluminum sheet capable of resisting severe cold drawing operations have become increasingly severe. Consequently, the aluminum sheet mill operator has had to pay special attention to the control of his annealing methods and furnish sheet to grain-size specifications.

Continuous Annealing for Aluminum Metal

Continuous methods of annealing have been developed in recent years for aluminum circles, sheet, and coil. Continuous, or so-called flash annealing, has been found ad-

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vantageous. With this process, individual pieces (or pieces stacked a few high) are passed through a heated chamber at such a rate of speed that the metal is exposed to the heat for only a short time. Grain-size control is practical and simple with continuous annealing. In mass (bulk) annealing, the question of stacking has received much attention with a view to permitting uniform and thorough circulation of the heat. Load temperatures are correlated with furnace temperatures in mass annealing. Time and temperature of exposure in annealing are now closely regulated. Mass annealing has been replaced to a considerable extent by continuous methods.

Quenching Heat Treatment for Alloys

VARIOUS aluminum alloys possess only ordinary mechanical properties as rolled or cast, but they can be heat treated to yield a wide range of properties. The tensile strength obtainable in some alloys by heat treatment is nothing short of remarkable. This also applies to the ductility and hardness. There has been considerable development of recent years in special aluminum alloys to be heat treated, both for cast and wrought manufacturers. So far, in alloys for working, nothing has been brought out that excels ordinary duralumin in all-around mechanical properties and usefulness.

Leading Proprietary Alloys

Most of the aluminum alloys used for parts to be heat treated contain copper or magnesium silicide, or both. Among the alloys claimed to be proprietary may be mentioned the following: Lautal, Carbium, Almelec, Scleron, Montegal, Aldrey, Constructal, 25S, and 51S. Lautal has attained considerable use abroad for both cast and wrought parts. The nominal composition is 94:4:2 aluminum-copper-silicon. Aldrey, also known as Wire Alloy No. 3, is typical of the compositions which have been developed abroad for use as cable for electric power transmission. This alloy contains 0.4 per cent magnesium, 0.5-0.6 per cent silicon, 0.3 per cent iron, and the remainder aluminum. There has been an influx of special heat-treated alloys for cable conductors in Europe. Mention should be made here of so-called Alclad. As usually supplied, Alclad consists of duralumin sheet coated with a thin layer of *pure* (Hoopes) aluminum. The material combines the good mechanical properties of duralumin with the corrision-resisting qualities of *pure* aluminum.

In the case of casting alloys, the following may be mentioned: 95:5, aluminum-copper: 95.8:4:0.2, aluminum-copper-magnesium, 94:5:1, aluminum-copper-silicon: 88.5:10:1.25:0.25, aluminum-copper-iron-magnesium: and 92.5:4:1.5:2, aluminum-copper-magnesium-nickel. The foregoing are nominal compositions, the alloys being made from aluminum containing say 0.2 to 0.3 per cent silicon and 0.3 to 0.6 per cent iron.

While many aluminum alloys are suitable for the production of cast or wrought parts to be heat treated, the bulk of present commercial requirements can readily be met with a relatively few compositions. One reason for the large number of alloys which have been developed lies in the attempts of competitors to get around patent claims.

There is a demand for alloys to be used in castings production, which, without quenching heat treatment, will age spontaneously to yield enhanced mechanical properties. Some development work has already been done in this direction. A wider field could be found for aluminum alloy castings if alloys could be developed which would harden and strengthen substantially by simple air aging for a few days, or by low temperature heating for a few hours, after casting.

Heat-Treating Equipment

EARLY equipment used for heat treating aluminum alloys was generally crude, inefficient, and poorly adapted for the work. Later, furnaces designed for steel treating were used. Today, with a more comprehensive understanding of the theoretical aspects of aluminum alloy heat treating, furnace equipment is designed to meet the special requirements of the operations to be carried out. Various types of heating equipment are still used in practice for annealing, soaking, and aging processes. Irrespective of the design of the equipment and method of heating, the chief requirements are accuracy of temperature control and uniformity of heat distribution.

In the writer's opinion, the supremacy of electric heating can hardly be questioned except on the grounds of first cost of installation and power operating costs. These higher costs may be outweighed by several advantages not obtainable with other methods of heating. The writer prefers electrically heated and automatically controlled equipment for annealing, soaking, and aging processes.

Car-type furnaces (batch or semi-continuous) are being favored over the older pan-type furnaces for the mass annealing of aluminum. In the case of continuous equipment for annealing sheet and circles, the usual construction involves a continuous moving belt or conveyor made of woven wire screen or separate wires, or bands, driven by variable speed mechanism. Such a belt passes through a relatively long chamber of restricted height. The continuous coil annealing furnace is a recent

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FOR many years Doctor Anderson has been an investigator of aluminum. He has been identified with it from its early days as well as with other branches of the non-ferrous industry. He is the author of numerous technical articles and papers, and of a book on aluminum. At the invitation of THE IRON AGE, he has given in the accompanying article a review of recent developments in the rapidly expanding field of aluminum alloy heat treatment, as well as some ideas as to the future.

development of importance. In the operation of this, aluminum coil is unwound from a drum, passed through the heated chamber of the furnace, and wound up at the other end on a blocker. A similar furnace has been developed for annealing aluminum foil.

Continuous Electric Furnaces Preferred

Continuous belt or pusher furnaces have been built for heating and soaking castings prior to the quench, particularly for such production jobs as pistons. Continuous aging oven may be combined. With such a unit, castings are charged onto the conveyor at one end of the soaking furnace, pass through the heated chamber, discharge into the quenching tank, are picked up by the conveyor in the tank, and are discharged onto the conveyor of the continuous aging oven where the heat treatment is completed. Such a unit is practically automatic in operation. Batch type furnaces are still largely used for soaking castings, and most aging operations are conducted in batch.

Special holders and jigs are used to advantage in heat treating certain manufactures to prevent distortion on heating and handling. Forced circulation of furnace and oven atmospheres has been found advantageous in maintaining uniformity of heat distribution.

Uses to Which Heat-Treated Alloys Are Put

THE development of heat-treatment processes as applied to aluminum alloys, both cast and wrought, has greatly extended the possible uses of these materials and broadened the market for their manufacture. There have been many interesting developments of recent years which have made possible the use of heat-treated aluminum alloy parts in construction in place of malleable iron, steel, copper, brass, and bronze.

Heat treatment has made possible the production of light aluminum alloy parts with so much higher mechanical properties that such materials are now used for a wide variety of engineering purposes where it was formerly impractical to consider aluminum alloys at all. Heat-treated aluminum alloys are now in regular competition with both cuprous and ferrous alloys.

So far, the chief applications of heat-treated aluminum alloys have come in the transportation field, including aircraft, motor cars, trucks, and buses. Interesting uses have been made of heat-treated alloys in the construction of street railroad cars, steam railroad passenger cars, and parts of locomotives. Certain of these applications are in the experimental stage. Substantial increase in the use of heat-treated aluminum alloys is seen in the modern tendency to save weight and increse speed in all kinds of transport. For highly stressed parts, the unheat-treated aluminum-alloy casting has passed out of the picture. Increasing use of duralumin-type alloy sheet and shapes is seen with the tendency toward all-metal construction of aircraft, while the modern Zeppelin-type ship could not be built without the use of this material.

Future Trend Outlined

IT is significant to the future business welfare of metal producers and manufactures that the heat treatment of aluminum alloy parts is not only here to stay, but is causing radical departures in practice. While possible future developments are difficult to predict, the writer believes that the progress of the past will be overshadowed in the next ten years. The number of alloys for use in heat-treated manufactures will doubtless increase. It is quite unlikely that these alloys will be found accidentally, but rather will be developed by systematic research. Also, with more alloys available, it will be possible to select material especially suited for particular purposes. The use of heat-treated structural shapes and forgings is expected to increase greatly.

With the development of heat treatment and new alloys, in the future a large proportion of the aluminum-alloy castings consumed by the engineering trades will be of the type once regarded as special, namely, special composition and heat-treated. Heat-treatment plant is now a necessary adjunct of the modern aluminum alloy foundry. Commercial heat-treatment plants are being called on to heat treat aluminum alloy parts, both cast and wrought. If the price of aluminum should be reduced appreciably, there would be a large increase in the use of heat-treated aluminum alloy manufactures, particularly in competition with steel.

Correct Wrapping Prevents Spots on Plated Ware

W. P. BARROWS, research associate of the American Electroplaters' Society at the Bureau of Standards, has studied the causes of "crystal spots" and "stain spots" on plated ware, especially builders' hardware. His findings, published in Research Paper No. 72, Bureau of Standards, are summarized as follows:

Two distinct defects have been included under the term "spotting out." One class called crystal spots appears only on metals having an "oxidized" surface—that is, one colored with copper sulphide or other sulphides and subsequently lacquered. The other, called stain spots, appears especially on cast metals, either plain or lacquered, as discolored irregular areas, usually with a small dark spot near the center.

Crystal spots consist of cuprous sulphide growing usually between the coloring layer of cuprous sulphide on the metal and the lacquer film. Their formation is caused or accelerated by sulphur in even minute amounts, such as may be carried in the atmosphere or from rubber bands or wrapping paper or cardboard cartons. Promising remedies are (a) exclusion of sulphur from the surroundings, (b) the use of lacquers found to retard spotting, (c) the application of a thin film of a grease, such as petrolatum, to the lacquered surface, and (d) the use of wax paper for wrapping.

Stain spots are caused by acid or a chemical compound absorbed in minute cavities in the metal during the plating process. In a humid atmosphere, these chemicals absorb moisture and exude upon and stain the surface. Alkaline substances are especially difficult to remove from the metal, once it is there, and it is not practicable to eliminate alkaline substances from the cleaning and plating solutions.

Sometimes porosity of the metal may be reduced by a change in pattern or in casting conditions. No method of rinsing or neutralizing was found entirely effective to clean the surface; baking at high temperatures before lacquering is sometimes helpful.

The two most effective remedies are to induce the action by exposing the articles to a high humidity before final finishing, or to use a lacquer which retards spotting. Phenol-condensation lacquers are less permeable to moisture than nitrocellulose lacquers, and are also more effective in retarding stain spotting.

A Year's Progress in Steel Treating

From the Viewpoint of the Testing Engineer—Nitriding, High-Test Iron, Bridge Wire and Gas Carburizing Among Features

BY H. F. MOORE*

THE testing engineer is not among the pioneer workers in heat treating. His viewpoint, then, is that of one who observes tendencies as to general agreement as to theory and technique among pioneer workers, and the tendencies to the formation of "current practice" in heat treating.

General Agreement Exists as to Principles

An outstanding feature of the past year has been the tendency to a fairly general agreement as to principles of heat treating, especially heat treating of iron and steel. An excellent example of this is seen in the statement of "Principles of the Heat Treatment of Steel" prepared by the metallurgical staff of the United States Bureau of Standards and issued in the *Transactions* of the American Society for Steel Treating. In the 90 pages of this pamphlet there is presented a concise statement, intelligible to the beginner in the study of heat treatment. Of course this statement, like all similar ones of physical "laws" is not to be regarded as final, but the fact that such a statement can be made is evidence not only of the skill of the authors, but also of the growing degree of stabilization of ideas on the subject.

Nitriding a Signal Feature

ANOTHER outstanding feature of heat-treating progress during the year is the development of the nitriding process for hardening the surface of steel. The layer of hard material produced by current processes seems to be very thin, and the use of the process for *strengthening* steel parts seems not to have encroached seriously as yet on the field of the case carburizing process. However, surface hardness without distortion of a piece, and a wide range of possible heat treatments of the core without much disturbance of the surface hardness seem to be features of the nitriding process which will render it very valuable to the maker of steel parts which have to withstand abrasive action.

What further possibilities (and limitations) of the process will develop as it is used in practice are matters of prime interest to all users of steel.

Advances Made in Heat-Treating Gray Iron

CAST iron foundrymen seem to have awakened to the possibilities of their product. This was shown by a special session of the American Foundrymen's Association in April [THE IRON AGE, April 18, page 1072], devoted to high-strength cast iron, and by the symposium on cast iron at the meeting of the American Society for Testing Materials in June [THE IRON AGE, July 4, page 6].

Heat treatment and alloying of gray cast iron have been found capable of giving a much better structural material than the ordinary gray iron of former days. The long structure-weakening flakes of graphite found in ordinary cast iron can apparently be induced to take unto themselves more globular and less damaging forms. Of course, this has been possible by the malleabilizing process for a long time, but heat treatment by other, and quicker, methods give promise of usefulness, although their usefulness and limitations are not yet clearly defined.

Gas Carburizing a Tempting Field

Progress in case carburizing, as seen by the testing engineer, has been mainly along the lines of improved technique, and in the development of gas carburizing. Gas carburizing, in which there is no need of expensive and frequently-renewed carburizing boxes, is indeed a tempting field for study. The necessity of heat treatment of

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Prof. H. F. Moore

AN authority on fatigue testing, Professor Moore is widely known among steel treaters and materials engineers. At the invitation of THE IRON AGE, he has reviewed in the accompanying article the more recent events in heat treating steel. He is a past-president of the American Society for Testing Materials and active in the work of the American Society for Steel Treating, as well as in research organizations and other technical societies.

carburized steel pieces, is more and more being recognized, and the fields of carburizing, nitriding, and of heat treating without alteration of chemical content are gradually becoming defined.

Steel Rail Heat Treatment Being Developed

PROGRESS in the field of heat treating plain carbon and alloy steels has been less spectacular, but the precision of the heat-treating processes and of measurement of temperatures has gone steadily forward. The behavior peculiar to the various alloying elements,—nickel, chromium, manganese, silicon, vanadium, molybdenum, tungsten, cobalt, and perhaps others—is becoming better understood. There seems to be a fair prospect of finding ways to use the less expensive alloying elements for a good many kinds of service. Some interesting work has been done in the preliminary development of heat treatments for railroad rails.

Designers Using Steel Must Know Heat Treating

A field, vitally related to the work of the heat treater is found in the drafting rooms and designing offices of makers of steel articles. The draftsman and designer is gradually gaining an understanding of the possibilities of heat treatment, and of its limitations. He must soon develop designing methods which shall take into account not merely the computed stresses and strains in his machine parts, but also the design of those parts so that they can be effectively heat treated without danger of destructive internal stresses.

The year has not passed without some costly lessons. Perhaps the most dramatic of these has been the troubles which have shown up in heat-treated wire for cables. Evidently here is a field requiring much study, with the possibility of the emergence to prominence of new factors which may weaken steel. The writer has heard of several conflicting theories of the cause of this trouble with wire for cables,—he is not going to advance any theory, but to urge that the progress of the investigation of this trouble, an investigation carried on by a number of laboratories—be closely watched by every steel treater and user.

Future of Tungsten Carbide

No record of the year's progress would be complete without a mention of the appearance of the new alloy, tungsten carbide, as a cutting tool—although this is not a steel at all. It was several years ago that Rosenhain in one of his addresses predicted the development of the tungsten-carbon alloys along lines roughly parallel to the development of the iron-carbon alloys. The tungsten-carbon alloys now used are a cutting-tool material rather than a structural material. What the future will bring is an intensely interesting uncertainty.

To the work and prospects of the steel treater the words of E. E. Slosson, spoken to the industrial chemists, are very true. In this field the progress of the past, instead of discouraging the hope of future progress, indicates numerous opportunities for it. In the field of heat treatment "there are as good fish in the sea as ever have been caught."

Navy Uses Color Markings for Identifying Metals

According to an announcement just made public by the Federal Standard Stock Catalog Board, Federal Co-ordinating Service, the following color designations will be used in marking the ends of metals (bar, billet, ingot and slab) for convenience in identifying:

Black (solid)—Copper, hard-drawn.
Black, with brown stripe—Steel, corrosion-resisting.
Black, with green stripe—Steel (SAE 1035), heat-treated.
Black, with lead stripe—Steel, Class A, bolt-material.
Black, with pink stripe—Steel (SAE 1035), semi-finished.
Black, with white stripe—Copper-nickel alloy.
Black, with yellow stripe—Manganese-nickel.
Blue (solid)—Bronze, rivet, medium.
Blue, with black stripe—Bronze, journal.
Brown (solid)—Steel, medium.
Brown, with black stripe—Steel, Class B, cold-rolled.
Brown, with blue stripe—Steel, nickel (SAE 2325).
Brown, with green stripe—Steel, Carbon (SAE 1035).
Brown, with lead stripe—Steel, carbon (SAE 1020).
Brown, with red stripe—Steel, carbon (SAE 1025).
Brown, with pink stripe—Steel, chrome-vanadium (SAE 6130).
Brown, with white stripe—Steel, carbon (SAE 1095).
Brown, with yellow stripe—Steel, nickel (SAE 2330).
Green (solid)—Steel, tool, carbon, Class 1.
Green, with black stripe—Steel, tool, carbon, Class 2.
Green, with blue stripe—Steel, tool, carbon, Class 3.
Green, with brown stripe—Steel, tool, carbon, Class 4.
Green, with lead stripe—Steel, tool, tungsten, Class 1.
Green, with pink stripe—Steel, tool, tungsten, Class 2.
Green, with red stripe—Steel, tool, carbon, Class 5.
Green, with white stripe—Steel, tool, carbon, Class 1, drill-rod.
Green, with yellow stripe—Steel, tool, tungsten, Class 1, drill-rod.
Lead (solid)—Aluminum.
Lead, with black stripe—Aluminum-alloy.
Pink (solid)—Brass, Naval, rolled.
Pink, with black stripe—Brass, commercial.
Pink, with lead stripe—Steel, chrome-vanadium (SAE 6145).
Pink, with red stripe—Steel, Grade P, semi-finished.
Pink, with white stripe—Steel, Grade V, semi-finished.
Red, (solid)—Steel, rivet, medium.
Red, with yellow stripe—Steel, rivet, Class B.
Red, with green stripe—Steel, spring.
Red, with white stripe—Steel, rivet, high-tensile.
White (solid)—Iron, wrought.
White, with black stripe—Steel, Class Ac, heat-treated.
White, with brown stripe—Steel, Class An, heat-treated.
White, with green stripe—Steel, Grade T, semi-finished.
White, with lead stripe—Steel, Class B, heat-treated.
White, with pink stripe—Steel, Grade N, semi-finished.
White, with red stripe—Steel, Class HG, heat-treated.
White, with yellow stripe—Steel, Grade W, semi-finished.
Yellow (solid)—Steel, machinery, cold-rolled.
Yellow, with black stripe—Steel, Grade R, semi-finished.
Yellow, with blue stripe—Steel, Class B-s (special), heat-treated.
Yellow, with brown stripe—Steel, Class C, heat-treated.
Yellow, with green stripe—Steel, Class C, semi-finished.
Yellow, with lead stripe—Steel, Class S, semi-finished.
Yellow, with pink stripe—Steel, Class B, bolt-material.
Yellow, with red stripe—Iron, cast.
Yellow, with white stripe—Steel, Class A, cold-rolled.

These colors have been used by the Navy for about fifteen years and presumably will be adopted by all departments and establishments of the Government after the issuance of the sheet of the Federal Standard Stock Catalog.

This method of identification, which represents a step in the simplification and standardization program of the Government, may be found applicable, by industry, or serve as a basis for a similar program.

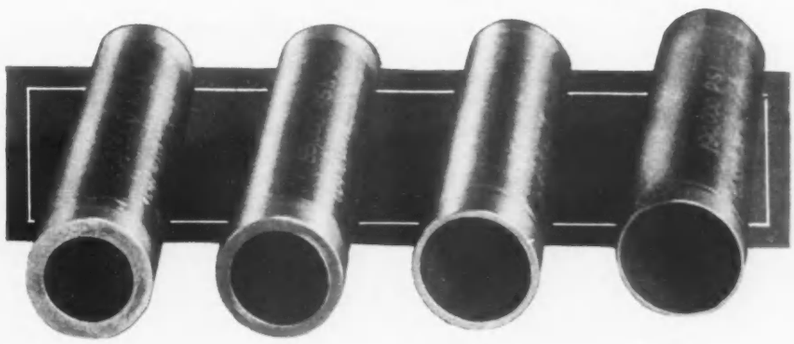
Austenitic chrome-nickel steel has been used in England for numerous seaplane parts. Cold worked wire of this type of material makes excellent springs, which have the added advantage of resisting the corrosion due to marine conditions. It also appears to be a satisfactory material for obtaining not only rustless rivets but also nuts and bolts, split pins, spar and hull fittings, skin plating and struts for floats. A modification in the composition of the austenitic nickel-chromium steels has resulted in the production of extremely satisfactory materials for exhaust manifolds and pipes.

Heat Treating Aircraft Parts

Large Electric Furnaces Handle Delicate Members Without Distortion—Exceptional Properties Obtained in Alloy Steels of Thin Section

BY HORACE C. KNERR*

HEAT treatment of delicately constructed aircraft members is one of the chief problems confronting the industry. The incorporation of steel, not heat treated, into wing spars, landing gear, struts, engine supports and sections of the fuselage, has frequently necessitated the use of fairly thick tubing—so thick, in fact, that the resulting weight was unsatisfactorily great, if not in some cases prohibitive. If these various parts could be successfully heat treated, a thinner section of tubing could be used with a saving in weight and an increase in strength and serviceability. To do this, however, without excessive distortion has hitherto been extremely difficult or impossible.



A B C D

Type of Steel	Commercial Grade	Mild Carbon, Normalized	Chrome-Molybdenum, Normalized	Chrome-Molybdenum, Heat-Treated
Tube	**A**	**B**	**C**	**D**
S.A.E. No.	1015	1025	4130X	4130X
Ultimate strength, lb. per sq. in.	40,000	55,000	95,000	200,000
Breaking strength of tube, lb.	23,600	25,800	25,600	27,700
Size, dia. wall, in.	1 x 0.250	1 x 0.187	1 x 0.095	1 x 0.047
Weight per ft., lb.	**2.00**	**1.65**	**0.92**	**0.50**

A method for successfully heat treating such delicate parts has recently been perfected and has resulted in large savings in weight and improvement in strength and safety of aircraft, at the same time opening the way for more extensive and more efficient use of high-grade alloys in the construction of aircraft. It is the aim of the present article to describe how this has been accomplished.

Steel and Other Materials Compared

STEEL is the lightest of all materials of construction, when strength and weight are regarded concurrently as they should be in the design of aircraft and other structures where weight and inertia are important factors.

One of the most important considerations in determining whether a certain material should be used in aircraft construction is its strength-weight factor. This factor is obtained by dividing the ultimate strength of the material in thousand of pounds per square inch by its specific gravity. This result is, of course, purely an abstract figure, having no inherent meaning in itself, but it provides a "rating" which is easily obtained and sound in principle.

Table I gives the strength-weight factors of typical materials used in aircraft construction.

Wood is virtually obsolete as a structural material for aircraft. It is obvious, from the strength-weight factors, that metal construction is lighter than wood where design is such that the full strength of the metal is taken advantage of.

The table and accompanying cut of tubes give a forceful illustration of the weight savings possible through the use of heat-treated alloy steel of high strength. The circles represent sections through tubes of equal outside diameter, but having wall thicknesses selected so that all will have the same strength in tension or simple compression.

A duralumin tube corresponding to those of that table would have a wall thickness of 0.40 in. and would weigh 0.06 lb. per ft. Therefore it would be 20 per cent heavier than the heat-treated alloy steel tube.

It appears that unheat-treated steel cannot long survive as a material of construction for aircraft, except in those parts which act as long columns, and where structural strength is therefore determined by the modulus of elasticity of the material and not by its tensile strength.

On the basis of strength-weight efficiency, it is plain that unheat-treated steel cannot compete with duralumin, but by heat treating a suitable alloy steel to even the moderate value of 150,000 lb. per sq. in., it becomes relatively as light or lighter than duralumin.

It seems certain that both aluminum alloys and heat-treated alloy steels will have an increasing use in aircraft construction, neither one replacing the other, but each finding the application which its particular characteristics will best serve. Steel of high strength probably will be employed for landing gear, engine mounts, wing beams and fuselage structures, especially for aircraft of medium and large size, while duralumin will have its place in the structural parts of small ships and for wing surfaces, fuselage covering, engine cowling and boat hulls in gen-

*Consulting metallurgical engineer and president Metallurgical Laboratories, Inc., Philadelphia.

Table I—Strength-Weight Factors of Materials

		S.-W. Factor
Wrought metals (tension):		
Music wire (0.10 in. dia.)	400÷7.85	51
Alloy steel heat-treated (high)	200÷7.85	25
Alloy steel heat-treated (medium)	150÷7.85	19
Duralumin	55÷2.85	19
Magnesium alloy	34÷1.75	19
Alloy steel heat-treated (low)	125÷7.85	16
Alloy steel normalized	95÷7.85	12
Mild steel normalized	55÷7.85	7
Aluminum annealed	12÷2.7	4.4
Wood (compression):		
Balsa	2.2÷0.12	18
Douglas Fir	6÷0.54	11
Spruce	4.3÷0.43	10
Oak (white)	5.9÷0.74	8

eral. Both steel and aluminum alloys depend, of course, upon heat treatment for their high strength.

Properties of Chrome-Molybdenum Steel

OWING to its remarkable combination of properties, chrome-molybdenum steel, No. 4130X, is rapidly becoming the standard structural material for aircraft.

This steel (Table II) is readily worked into seamless tubing of the required diameters and thin walls, as well as into sheet and bar stock. When properly made and annealed, it will withstand severe cold forming as in the manufacture of fittings, and can be readily hot worked as in the bending of tubes or the production of forgings. It is easily machined in the annealed state, and one of its outstanding characteristics is superior machineability in comparison with other alloy steels, after heat treatment to a given high strength and hardness. It has exceptionally fine welding characteristics under the oxyacetylene flame, and also is readily welded electrically.

By means of a normalizing treatment consisting simply in heating above the critical temperature, about 1600 deg. Fahr., and allowing to cool freely in air, it develops a tensile strength of 95,000 lb. per sq. in. or over, with a yield point of 60,000 lb. per sq. in. or over, and an elongation of more than 12 per cent in 2 in.

Oil Better Than Water for Quenching

After welding, a section near the weld has unavoidably been heated to an annealing temperature. This portion has a strength of something better than 80,000 lb. per sq. in. These physical properties are satisfactory for certain parts of aircraft where the members act as "long columns" and design stresses are determined principally by the elastic modulus of the material.

One of the most satisfactory characteristics of this steel, however, is its response to heat treatment, consisting of quenching from about 1600 deg. Fahr. followed by suitable tempering. It may be quenched either in oil or in water. Various authorities (including certain Government specifications) have heretofore recommended quenching in water, but experience at the Metlab plant has shown that oil quenching is decidedly preferable for parts other than those of large or heavy cross section.

Oil produces as good or better tensile strength than water and gives a higher combination of strength and ductility. It also appears to give a higher yield point or elastic limit for a given tensile strength. At the same time there is little tendency to cause warping during the quenching operation and the liability to cracking in quenching is practically eliminated, whereas these are considerable when water is the quenching medium.

Values given in Table III are typical of the results obtained in the heat treatment of this steel by the method described in this article.

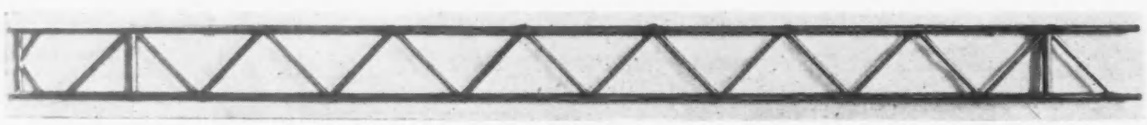
Table III—Typical Tensile Properties of Chrome-Molybdenum Steel, No. 4130X, Oil-Quenched and Tempered

	Yield Point, Lb. per Sq. In.	Ultimate Tensile, Lb. per Sq. In.	Elong. in 2 In. Min. Per Cent
Specified	110,000	125,000	11.0
Obtained	115,000	130,000	*16.0*
Specified	130,000	150,000	9.0
Obtained	140,000	155,000	*12.0*
Specified	140,000	175,000	7.0
Obtained	160,000	180,000	*10.0*
Specified	150,000	200,000	5.0
Obtained	185,000	215,000	*8.0*

Note.—Owing to geometric effects in the specimen, specified elongation must be much lower for thin specimens than for thick. The above values are corrected for thickness.

Manufacturing and Treating Problems

FABRICATION of aircraft parts consists primarily in the cutting to size and shape of sheet and tubing, bending and forming, and assembly by welding. Machining operations in the ordinary sense are restricted to a few parts requiring accurate surfaces and fit, such as axles, end fittings for struts and engine mounts and the like. Where a moderate strength is sufficient, the steel may be fabricated in the normalized condition and left so. For important structural parts which are subjected to high stresses, shock, fatigue and overload, this steel is fabricated in the annealed state, and heat treated after welding. In some cases, it is desirable to heat treat parts before assembly and then assemble by means of (tubular) rivets, instead of welding. The good machining qualities of chrome-molybdenum steel make it possible to cut, drill and otherwise machine parts prior to assembly which have been treated to a strength of 150,000 to 200,000 lb. per sq. in.



A WING Spar Made of Steel Tubing Heat Treated Successfully After Assembly. Length 10 ft. Heat treated to 135,000 lb. per sq. in. A delicate member which can be handled in a vertical furnace

Table II—Chrome-Molybdenum Steel, Composition No. 4130X Army-Navy Standard

	Per Cent
Carbon	0.25 to 0.35
Manganese	0.40 to 0.60
Phosphorus (max.)	0.040
Sulphur (max.)	0.045
Chromium	0.80 to 1.10
Molybdenum	0.15 to 0.25

Heat treatment of aircraft parts is in a class by itself. Made, as they are, of tubing and sheet ranging in thickness from about 0.035 in. to ¼ in. and varying in size, shape and length from small fittings to axles 6 or 8 ft. long, engine mounts 3 ft. sq. and wing spars 25 ft. in length, they are extraordinarily delicate at the quenching temperature and exceedingly liable to distortion. They are likely to cool prematurely and irregularly during transfer from the furnace to the quenching tank. Because of their thinness, a small amount of scale or decarburization has a large effect in reducing the strength of the members. They are often of complex form. Typical heat-treated parts are shown in some of the illustrations.

Attempts to heat treat aircraft parts by the usual methods and in the ordinary furnaces are generally disas-

trous. During heating through the critical range they sag under their own weight. On lifting out of the furnace for quenching they sag again, in other directions. Upon quenching horizontally they warp again due to side contact of the quenching medium. There are therefore three chances for distortion. Attempts to straighten after heat treatment usually result in denting or crushing, because of the thinness of the walls.

Difficulties encountered were so serious, and the failures so costly, that many aircraft engineers became discouraged and gave up the idea of using alloy steels where heat treatment was required, sacrificing lightness or using more costly or less satisfactory means of construction.

The author's contact with these problems as chief metallurgist of the Naval Aircraft Factory, Philadelphia, convinced him that the difficulties could be solved only by suspending the parts vertically during heating, in such a way as to avoid all tendency to distortion, in a furnace permitting close control of both atmosphere and temperature, and arranged for quenching the charge without rehandling it, by lowering it without other movement into a quench tank placed directly beneath. Furthermore, the charge must be kept under control during quenching, being lowered rapidly, but without swinging, out of the furnace into the quenching tank, where it must be brought to rest beneath the surface without shock. Quenching should be in oil.

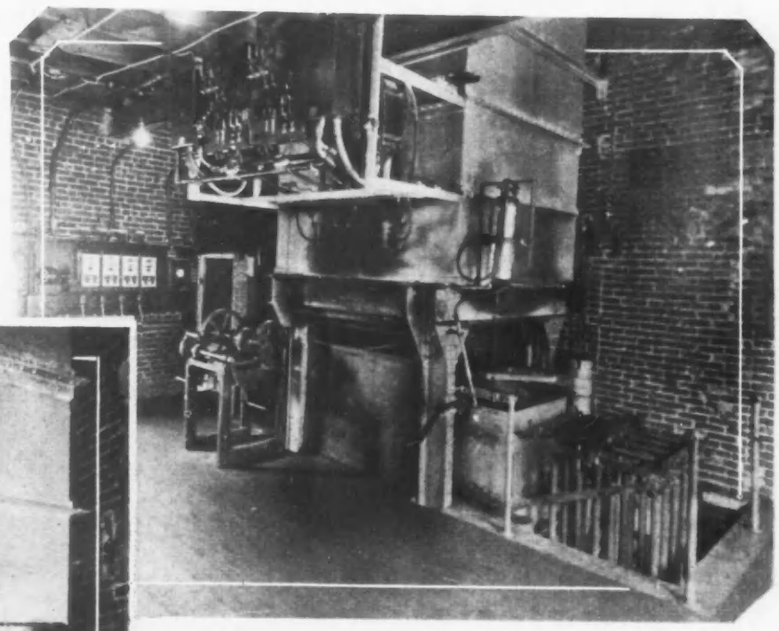
The advantages of oil as a quenching medium have been outlined, but its use entails a serious fire hazard which must be guarded against. When the oil enters hot tubular members at the moment of quenching, there is a tendency for it to break down into its more volatile constituents. These are superheated on passing upward through the tubes and issue from the open end as a mass of flame. Should a charge become stuck part way out of the oil bath, or be lowered too slowly, a very large amount of flame may be produced, with serious consequences. In obtaining the advantage of the use of oil as a quenching medium, it is necessary to overcome this danger.

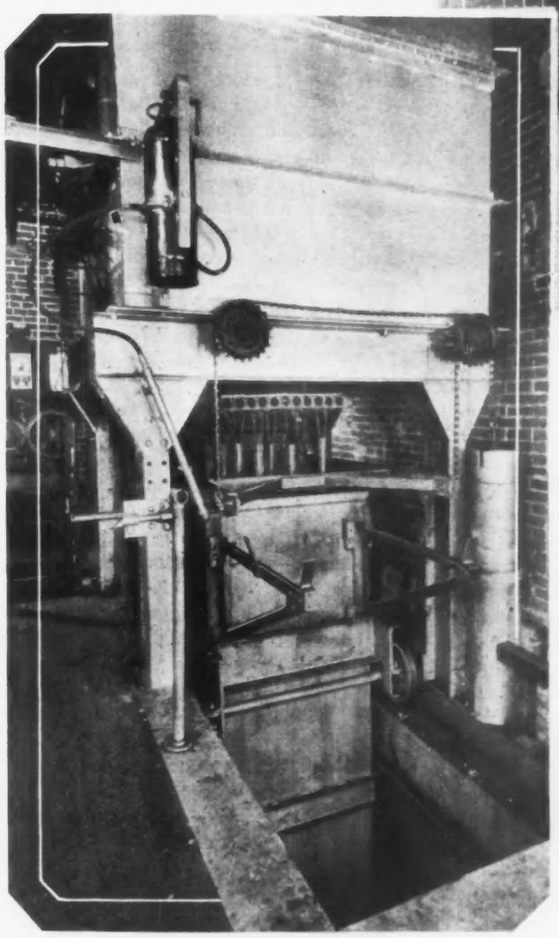
Aircraft parts may be divided roughly into four classes:

1. Fittings and other small miscellaneous parts.
2. Bulky parts such as engine mounts, fuselage sections, landing gear of the V-strut type, etc.
3. Long straight members including axles, struts and wing beams.
4. Tubing and bar stock to be fabricated after heat treatment.

For economical operation these call for three furnaces of different size and shape. A small furnace for class 1, a furnace of large section and moderately great length for class 2, and a furnace of moderate section but great length

BELOW Is Furnace 11 Ft. High and 33 in. Sq. Inside. Quench tank is directly under furnace in position it would be in for quenching. The charge is shown almost in the oil with the alloy spider just appearing below the furnace





THE General View of 10-Ft. Furnace. Furnace resting on framework in centre of picture (above). Quench tank is seen just to right of legs of furnace. A charge has been hung on the alloy spider which is resting on the rack attached to the quench tank. The next operation would be to lower the door, roll it to one side and move the tank so that rack is directly under furnace opening and pull the charge up into the furnace. The automatic controllers and recorder are seen to the left on the wall. The control relays are mounted in front of the furnace. The winch for raising and lowering the work is directly to the left of the furnace

CENTER Section Cross Tube on Bottom of Fuselage, Heat Treated to 200,000 Lb. per Sq. In.

for classes 3 and 4. Small parts may, of course, be treated in either of the furnaces intended for parts of class 2 or 3, when the quantity warrants.

Necessity for close and automatic temperature control, and the vertical position of the heating chamber favor the use of electrical heating. Electrical furnaces of the size required to handle aircraft parts of classes 2, 3 and 4 and having the necessary temperature regulating equipment and the mechanism for handling the charge are quite costly. They must have a reasonably large capacity in pounds per hour to avoid an excessive labor cost per pound of work heat treated. For anything like continuous operation they would therefore have an output far in excess of the production requirements of even the largest aircraft manufacturer today or for some time to come.

To the high first cost, maintenance, depreciation and electrical stand-by charges, there must be added the burden of overhead of a highly trained staff. The heat treatment of aircraft parts calls for specialized metallurgical knowledge on the part of the management and carefully trained operatives at the furnace.

The answer to the problem is believed to be found in the creation of a central plant with specially designed furnaces operated by specialists and fully equipped in every way, including laboratory facilities, to which aircraft manufacturers may send their parts for heat treatment. By massing the production in this way, the cost of treatment per pound is brought down to a reasonable figure. Such a plant has been established in Philadelphia, a location which probably is near the center of production of the aircraft industry and otherwise favorably situated. The plant is described in the following:

Design of the New Furnaces

TWO furnaces designed by the author constitute the major items of equipment. One has a heating chamber 3 ft. sq. and 10 ft. high, for the treatment of parts of moderate length but large width, such as landing gear, engine mounts, fuselage sections and the like. The other is capable of handling parts up to 25 ft. long and 2 ft. in diameter, such as wing beams, spars and straight tubing and bar steel. Small parts are handled in quantities in either furnace.

These furnaces are similar in construction and operation. They really should be referred to as heat-treating machines, as the furnace itself is only one unit in a relatively complex mechanism, every part of which must function correctly and with precision in order that satisfactory results may be obtained.

Each furnace has a capacity of 400 lb. of steel per hr. By operating continuously it would therefore be possible to turn out 57,600 lb. of work in either furnace in a 6-day week. This is equivalent to more than 5,000,000 lb. a year for both furnaces together, which presumably would be ample capacity for the needs of the entire aircraft industry for some time to come.

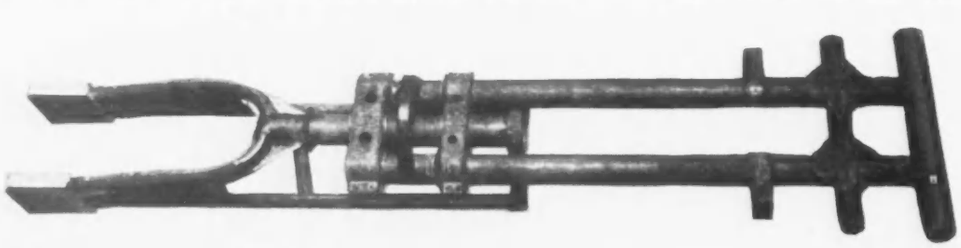
At the present time, when the demands are small in comparison with the furnace capacity, each furnace is used for quenching on one or two days only of each week. As the power stand-by charge is high, and is determined by the peak load in any month, the two furnaces are connected with the same main power switch, and used alternately, never simultaneously. The temperature controllers and recorders are arranged so that they may be connected with either one furnace or the other and so that one set suffices for both. When production increases to a point warranting the extra stand-by charges involved in operating both furnaces at once, this can easily be arranged by adding another main switch and control panel and making a few changes in wiring.

The furnace heating elements consist of nichrome ribbons suspended upon General Electric refractories. The lining is of supersilocel brick and is backed up by 13 in. or more of silocel powder insulation. The heating elements are divided into horizontal zones, the 10-ft. furnace having 4 zones and the 25-ft. furnace 6 zones. The zones nearest the top and bottom are of shorter length than the intermediate zones, in order to take care of end losses.

Each zone is automatically controlled by a Wilson-Maeulen controller. It is possible to maintain temperature uniformity throughout the heating chamber within plus or minus 10 deg. Fahr. at any temperature up to 1700 deg. Fahr. The temperature at various points in the furnace is recorded continuously on a Leeds & Northrup multiple point recorder. The recorder and controllers are on entirely independent thermocouple circuits so as to afford a check and warning should any part of either system get out of order. A fan is provided to circulate the furnace atmosphere and insure uniformity at low as well as high operating temperatures.

The two furnaces have about the same power demand, about 90 to 95 kw. and are connected with a 220 volt, three-phase line. Radiation losses are about 30 kw. at 1600 deg. Fahr. They are placed vertically side by side upon structural steel columns, and having a working space between them. The quench tanks are mounted directly beneath the furnaces on small cars having ball-bearing wheels which run on tracks attached to the columns, permitting the tanks to be moved laterally. The bottom of each furnace is fitted with a door or plug, which is first lowered and then moved to one side when charging or discharging the furnace.

The furnaces are elevated to such a height on



FRONT Landing Gear, Fabricated and Heat Treated by Metlab. Heat treated to 180,000 lb. sq. in. Overall height, 5 ft., 6 in.

the structural steel framework as to be conveniently operated from the second floor of the building, thus avoiding the necessity for a large excavation in order to accommodate the quenching tanks. The tank for the 10-ft. furnace together with its sump tank is entirely above ground level; the lower part of the tank for the 25-ft. furnace, itself 27-ft. deep, moves in a concrete lined well 12-ft. deep, the remainder being above ground.

Both furnaces are in a small building separated by a brick wall from the main building and reached through a fire door. The work is prepared in the main building and passed through the fire door for loading and back again after treatment. This arrangement removes the fire hazard from the main building, which is utilized for manufacturing purposes.

All openings in the furnace, such as power and thermocouple leads, are sealed, so that no draft occurs and the atmosphere of the heating chamber can be closely controlled. Oxidation of the work is thereby avoided.

A sump tank, which is stationary and provided with water-cooling coils, is placed on the ground directly beneath the quench tank of the 10-ft. furnace. By means of a centrifugal pump the oil is pumped from the sump tank to an inlet in the bottom of the quench tank and allowed to overflow through a manifold at the top of that tank, from where it returns through a down pipe to the sump tank. The hottest oil therefore overflows immediately and is cooled while new oil replaces it in the tank from below. This produces an ideal circulating arrangement. Additional and quite strong circulation is produced in the quench tank by means of stirring devices. The same sump tank is used for both furnaces, being connected with the circulating system of either quench tank by means of three-way valves.

Quenching and Tempering

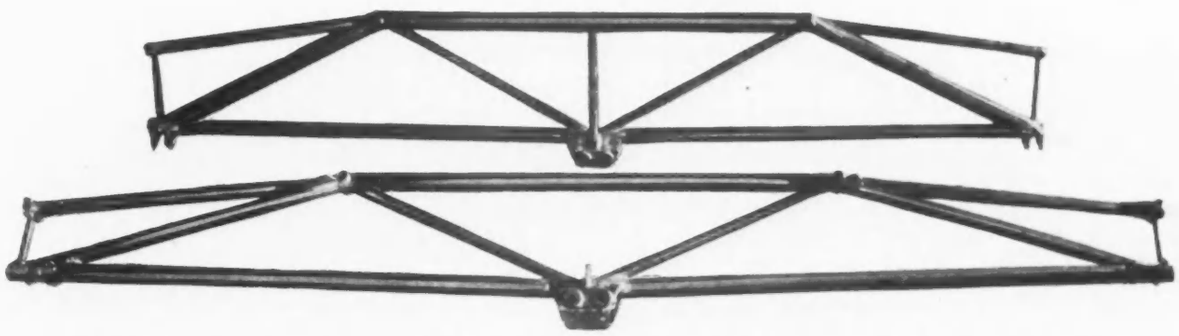
THE work to be heat treated is hung on a rack or spider of heat-resisting alloy, by means of nichrome wires or hooks. It is suspended in such a way as to be free from all tendency to sag under its own weight while hot. The spider and charge are now raised into the heating chamber where they remain suspended until ready to be quenched. The quenching tank is then brought into position directly below the opening in the bottom of the furnace, and the charge is lowered straight down into it, without other motion.

While the production demands are not great, a furnace is used for quenching on one day and for tempering on the following day. The temperature of the heating chamber has by then dropped to that required for tempering (600 to 1100 deg. Fahr.), so that only a small amount of current is needed for the latter. The operations during tempering are similar to those during quenching, except that the oil is drained from the quenching tank. When it becomes necessary to run the furnaces continuously for quenching at 1600 deg. Fahr., separate furnaces designed especially for the purpose will be installed for tempering. These will be of different and simpler construction.

Some Results Obtained

THESE furnaces have been used for about a year, in the heat treatment of a great variety of aircraft parts. The percentage of loss due to unsatisfactory treatment, including warping, has been nearly zero. The physicial properties obtained are usually far in excess of the specified values (see Table III) and in fact exceeded expectations for this grade of steel. Examples of high-tensile properties of test specimens of parts are shown in Table IV. This steel is in no sense "brittle," as specimens can be bent nearly double without cracking.

LANDING Gear, Heat Treated to 180,000 Lb. per Sq. In.



Center Section Spars, Front and Rear. Heat treated to 180,000 lb. per sq. in. Length, 8 ft.

Distortion has been reduced to a negligible point. The first wing beam treated was 10 ft. long. After treatment the deformation was less than 3/16 in. in 10 ft. and this has been bettered in the considerable number of such beams treated to date. Parts of complex form, such as shown in illustrations, have been treated without noticeable distortion.

Duralumin Treated in These Furnaces

THESE furnaces are suitable also for the heat treatment of duralumin and other aluminum alloys, either cast or wrought. These alloys, when made up into delicate and complex parts such as bulkheads for flying boats, fuel tanks, etc., have a persistent tendency to distortion

Table IV.—Typical Examples of Physical Properties Obtained by the Heat Treatment Described

Dimensions, Inches	Area, Sq. In.	Yield Point Lb. per Sq. In.	Ultimate Strength Lb. per Sq. In.	Elongation Per Cent in 2 In. Max.	Min.	Aver.
0.083 x 0.489	0.0406	192,000	211,000	6.0	5.5	5.75
0.154 x 0.495	0.0762	201,000	213,000	8.5	8.0	8.25
0.112 x 0.495	0.0554	200,000	211,000	7.0	7.0	7.00
0.083 x 0.490	0.0407	191,500	226,000	5.0	4.0	4.50
0.188 x 0.710	0.133	212,000	229,000	9.0	9.0	9.00
2¼ x 0.125	0.817	185,000	230,000	11.0	8.5	9.75

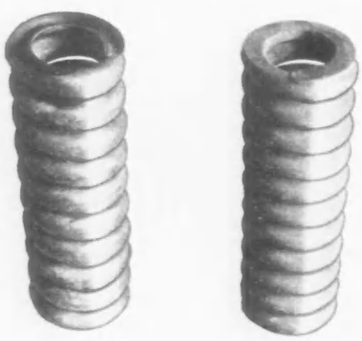
*Tube tested in full section; other flat specimens cut from wall, gage section ½ in. by 2 in.

†These values are high in view of thinness of specimen.

during heat treatment when treated in the ordinary way, even though the temperature is low, because of the great plasticity of the metal at the quenching temperature.

Such parts may be heat treated in these furnaces by suspending them with iron wires from the spider at as many points as necessary to distribute the weight evenly and avoid sag. In one case parts treated in this furnace were straightened after quenching with approximately a half hour's work, whereas it had previously taken five or six man-hours of labor to accomplish the result after quenching in water.

It has been shown that the corrosion of duralumin is influenced by the rate of cooling during the quenching operation.* Quenching in water produces a greater resistance to corrosive attack than quenching in oil or cooling in air, although the tensile properties obtained are practically the same with oil, hot or cold water, and only moderately lower with air.



COMPARISON of Springs Made from Solid Spring Stock and Chrome-Molybdenum Steel Seamless Tubing. The spring on the left, made from tubing, weighs two-thirds of the one on the right, made of solid stock, and carries a 15 per cent greater load. Heat treated to 200,000 lb. per sq. in.

water.

The new form of duralumin, known as Alclad, which has a thin coating of almost pure aluminum on its surfaces, has an immensely greater resistance to corrosion than ordinary duralumin. As this material owes its resistance to corrosion to the coating and not to the properties of the metal itself, it is probable that oil quenching would be satisfactory and would show no inferiority in its resistance to corrosion compared with Alclad quenched in water.

It has been found that oil produces very much less distortion in quenching than water. Owing to the fact that duralumin is soft immediately after quenching, it is common practice to make up parts, quench them and then do any necessary straightening while the material is still plastic. Due to the considerable distortion caused in water quenching, this straightening operation is often quite costly and tedious. It may therefore be avoided by using Alclad and quenching in oil, heating being done in an electric furnace instead of molten salt to avoid the adherence of the latter to the work. The elimination of salt as a heating medium removes another possible source of corrosion.

Other Uses for the Furnaces

These furnaces are finding many uses outside of the aircraft industry, wherever parts of relatively thin section and long length must be heat treated without distortion. For example, hollow steel rolls such as are used in the textile and linoleum industries; arbors; blades, such as are used in paper machinery; shafts, both hollow and solid, such as are used in the oil industry.

The furnaces are satisfactory for carburizing long members, such parts being packed in tubular retorts of thin wall. Heating while suspended vertically avoids the sag which usually occurs during carburizing in horizontal boxes.

Complete testing and metallographic laboratory facilities are a part of the plant equipment. Tensile test specimens representing the material are introduced with each charge and are tested immediately after heat treatment.

Aircraft manufacturers located at a distance from the plant usually find the delay incidental to shipping their parts for heat treatment and return interferes with production schedules and adds an item of expense. In connection with the heat-treating plant, a fabricating shop for aircraft parts has therefore been established in which wing beams, landing gear and other parts requiring heat treatment are made up to the aircraft manufacturer's blue prints and specifications, heat treated and shipped to the aircraft plant ready for final assembly.

*"Duralumin" *Transactions* of American Society for Steel Treating, 1922, by Horace C. Knerr.

Surface of Drilled, Reamed and Press-Finished Holes

Smoothness of interior finish of drilled, reamed, or press-finished holes has been studied by Dr. O. Schlippe (*Engineering*, July 12, 1929, page 33). The quality of the surface left in a drilled hole depends upon the metal and the speed; those drilled in harder steels and cast iron are generally smoother than in copper. Smoothness is also promoted by low speeds and small feeds. Reamers make a much better hole, if sufficient care be taken not to gouge the surface with tiny chips entrained in the cutter.

Aside from grinding and polishing, the best hole is made by press finishing, i.e., forcing a polished steel ball through a slightly undersize hole, already drilled and reamed. This gives a work hardened surface, smooth as a mirror, similar in aspect to a cleaned gun-barrel.

Doctor Schlippe's studies were made on gelatine casts of the surfaces, and are summarized in the table. The reamed holes, though much smoother than the drilled ones, have tiny and sharp corrugations which scatter the light and give a dull luster. Press finishing obviously cannot smooth out the irregularities in drilled holes in a single pass, unless the increase in radius is of the same order as the deepest groove. Several passes with increasing ball sizes may be necessary before this end is reached.

Worked by	Material	Maximum Groove Depth in Microns (0.001 mm.)
Twist-drill	Ingot-iron	About 30
"	Open hearth steel	" 20
"	Perlitic cast iron	" 45
"	Bronze	" 12
"	White metal	" 10
Reamer, machined	Ingot-iron	" 8
" by hand most carefully	" "	" 5
Reamer, by hand	Open hearth steel	" 6
" " "	Perlitic cast iron	" 12
" " "	Bronze	" 5
" " "	White metal	" 5
Press finish-ball	All materials	About 1 to 2

Revises Specification For Manganese Steel Welding Rod

Chemical specifications for manganese steel welding wire have been revised by the American Welding Society to read as follows:

Carbon	1.10 to 1.35 per cent
Manganese	11 to 14 per cent
Phosphorus	0.05 to 0.09 per cent
Sulphur	0.007 to 0.04 per cent
Silicon	0.10 to 0.20 per cent

Such rods are intended for use in building up surfaces where an extremely hard, tough metal is required, such as track frogs, crossing centers, switch points and dredge buckets.

Strip or open-pit mining is adapted to minerals of low market value. For instance, anthracite averages $5.60 in value a short ton and bituminous coal $2.20; copper, $2.80 to $4.40 a long ton; iron, $4.55 a long ton; bauxite, $6.15 a short ton; and pebble phosphate, $3 a long ton.

Making a Whirlwind Crankcase

Successive Steps in Machining the Castings for a Nine-Cylinder Wright Engine—Multiple Operations Performed Simultaneously or in Sequence

BY FAY LEONE FAUROTE*

MANUFACTURE of the Wright crankcase begins in the foundry with the act of making an assembly of the cores in the mold. Due to the intricate form of some of these aluminum-alloy castings, it is of the utmost importance that all cores be properly placed and the molds be well ventilated.

After pouring, the molds are shaken out, core wires removed, sprues and risers sawed off on the band-saw, the casting chipped with chisels and files, snag-ground on an emery wheel and finally sand-blasted. They are then given a general inspection on a checking fixture for the correct location of pads, bosses, etc. After being pickled long enough so that cracks, seams and other defects, if any exist, may be easily spotted, the castings are thoroughly washed in boiling water, and meticulously inspected.

The first series of machine operations on the crankcase castings, which are performed on a 36-in. Bullard vertical turret lathe, are as follows:

Rough and Finish Face and Turn Flange, Recess and Bore

Rough face rear section flange to 6 13/16 in. from center of cylinder hole (check 3/16 in. thickness of flange).
Rough face crankshaft bearing hub to 2.297 in. ± 0.004 in. from face of flange.
Rough turn 12 9/16-in. diameter to 12⅝-in. diameter, making 2.262-in. dimension 2¼ in.
Rough form recess to 12⅝ in. diameter, holding 45-deg. angle.
Turn 12⅝-in. diameter making 2.917-in. dimension 2 29/32 in.
Rough bore 3.703-in. diameter hole to 3 41/64 in. diameter.
Rough bore 17.312-in. diameter to 17¼-in. diameter x 5/16 in. deep.
Finish face flange to 6 25/32 in. from center of cylinder holes.
Finish turn 12 9/16-in. diameter up to 2.262-in. ± 0.002-in. dimension.
Finish form recess to 12 9/16-in. diameter, turning 12 9/16-in. diameter up to 2.917 ± 0.002-in. dimension.

*Mechanical engineer, New York. In THE IRON AGE of July 18, page 148, Mr. Faurote described the airplane engines of the Wright Aeronautical Corporation. In the issue of Aug. 8, page 337, he told how the connecting rods were machined, in the issue of Aug. 15, page 402, he covered the machining of the crankshaft, and in the issue of Aug. 22, page 462, he outlined the steps in machining the cylinders. A final article will be devoted to the assembly work.

TURNING and Facing Flange, and Boring Main Bearing Hole in Crankcase, Main Section, of J-6 Series Engine

Multiple Drilling All Flange Holes in One Operation on Crankcase of J-6 Series, Nine-Cylinder Whirlwind

Finish bore 17.312 ± 0.0015-in. diameter x 5/16 in. deep, holding 1/16-in. radius and forming 1/16 in. x 45 deg. chamfer.
Finish bore 3.703 ± 0.0005-in. diameter hole.
Finish bore 3/16 in. wide x 3⅞ in. diameter recess in 3.703-in. hole, holding 1/32-in. radius in corner ⅜ in. from face of boss.

Next the front face of hub is faced, turned and chamfered on a 36-in. Bullard. The operations, after clamping casting in fixture, are as follows:

Rough face front section to 10 5/16 in. diameter overall.
Rough turn 16.249-in. diameter to 16 5/16 in. diameter x 5/16 in. long.
Finish face to 10 9/32 in. overall.
Finish turn 16.249 ± 0.0015 in. x 5/16 in. to size, holding 5/64-in. radius.
Form 1/16 in. x 45-deg. chamfer.
Rough face crankshaft bearing hub to 1.031 in. overall.
Form 1/16 in. x 45-deg. chamfer in 3.703-in. diameter hole.
Break sharp edges.

Next the 20 flange holes are drilled on a No. 2 Baush multiple drill, using a jig. Money has not been spared in securing machines which will lower production costs. The drilling has this series of operations:

Set casting in baseplate.
Set jig in place and target cylinder pads and valve tappet guide bosses.
Clamp fast.
Drill twenty 11/32-in. diameter holes through.

A 3-ft. sensitive radial drill is used for two successive operations. First it serves to drill and countersink blind holes, as follows:

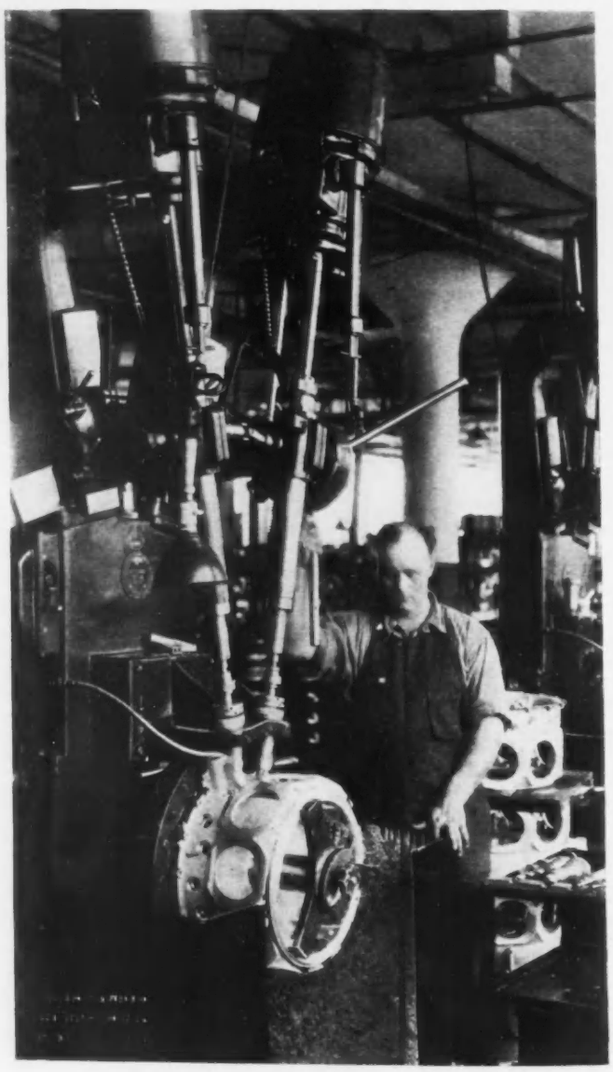
Drill three 11/32-in. diameter holes x 3/64 in. deep. (Grind point of standard drill to 7 deg.)
Remove jig.
Countersink slightly to remove burrs (flange face side only).
Use hand burring countersink.

Five holes then are drilled with the 3-ft. sensitive radial drill:

Drill two 23/64-in. diameter holes and ream to 0.375 in. ± 0.001-in. diameter through (these holes are held close, contrary to B. P., for later machining operations).
Drill three 11/32-in. diameter holes x 3/64 in. deep to point of drill. (Grind point of standard drill to 7 deg.)

Then with a Baush multiple drill, 14 "F" holes, 0.257-in. diameter x ⅞ in. deep, are drilled in front section mounting flange. The casting is next transferred to the table of the 3-ft. sensitive radial drill. Then the fourteen 5/16 in.-18P tap holes in front section mounting flange are counterbored to 21/64 in. diameter x 1/64 in. deep.

Next a 45-deg. pad is milled on a plain miller, milling a 45-deg. face, holding 2 23/32-in. dimension and 8 31/32-in. dimension.



Drilling, Reaming, Tapping Valve Guide Holes in Crankcase, Main Section, of Nine-Cylinder Engine

The oil strainer housing is milled on a No. 2 plain miller, rough and finish milling it to 12 in. from centerline. A 0.125-in. feeler is used to set for the finish cut.

The nine cylinder pads are milled on a rigid mill, being rough and finish milled to 9.000 ± 0.005 in. from center. The measure is made from center plug with flush pin gage.

Nine cylinder holes are rough and finish bored to 5.196 ± 0.005-in. diameter and then chamfered 1/16 in. x 45 deg. with a heavy-duty drill.

Valve tappet holes are drilled, bored and reamed on a Leland-Gifford two-spindle special drill. Proper position of valve tappet guides is essential for smoothly working valve actuating mechanism. The work proceeds with the following series of operations:

Drill two valve tappet holes (exhaust and intake) at 1.797 ± 0.003 in. and 2.452 ± 0.001 in. dimension from rear flange, ¾ in. diameter, through bosses and carrier ring. Index and repeat to a total of nine operations.

Step drill two valve tappet holes (exhaust and intake) 15/16 in. to 1¼-in. diameter (1¼-in. diameter to 8 3/32 in. from center). Index and repeat to total of nine operations.

Bore two valve tappet holes (exhaust and intake) 1 3/64 in. diameter and 0.900 in. diameter through. Index and repeat to total of nine operations.

Counter bore two valve tappet holes (exhaust and intake) to 1.293 ± 0.002-in. diameter to 8 1/16 in. from center. Form 1/32-in. x 45-deg. chamfer at 1 3/64-in. diameter hole. Index and repeat to total of nine operations.

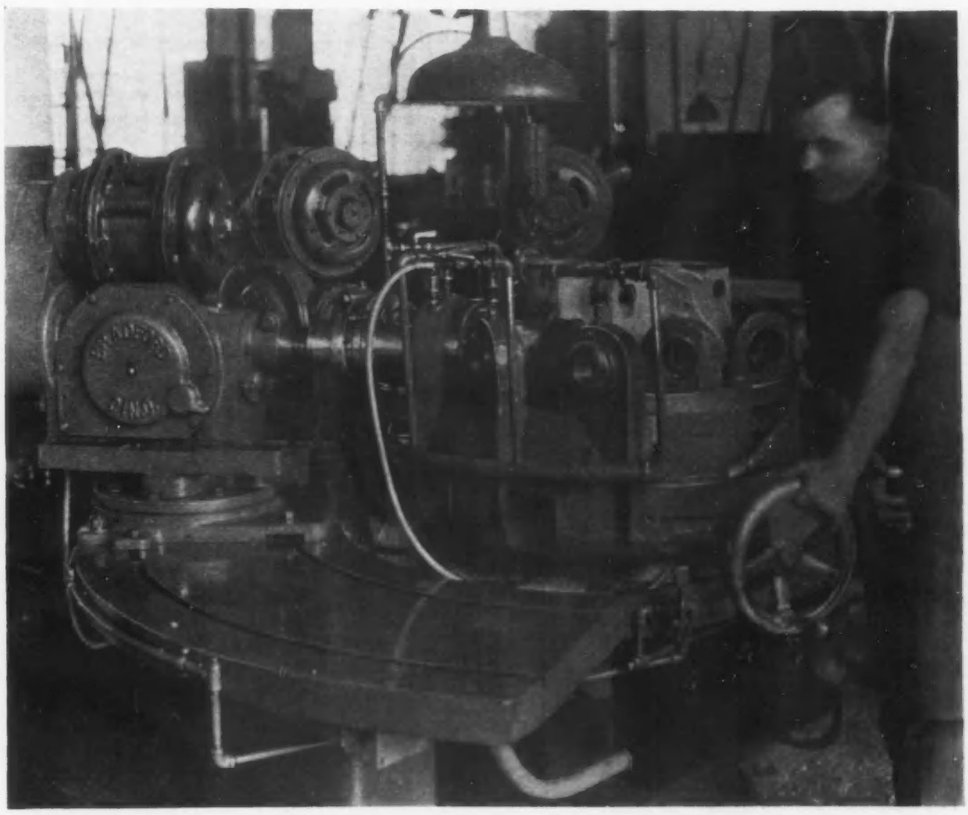
Spotface two valve tappet holes (exhaust and intake) 1½ in. diameter to 8⅝ in. dimension from center. Form 1/16-in. x 45-deg. chamfer at 1.293-in. diameter hole. Index and repeat to total of nine operations.

Line ream two valve tappet holes to 1.0625 ± 0.0005 in. and 0.916 ± 0.0005 in. diameter. Index and repeat to total of nine operations.

Tap two valve tappet holes 1⅜ in.-12P USSF to gage to ⅜ in. dimension full thread. Index and repeat to total of nine operations.

Cylinder pad holes are drilled, counterbored and tapped, using a Leland-Gifford special drill, with the following operations:

Drill eight 5/16-in. diameter holes 1 in. deep in cylinder pad.
Index and repeat for total of nine pads.
Counterbore eight holes 13/32 in. diameter x 1/64 in. deep.
Index and repeat for total of nine pads.



SPOT Facing, Boring and Tapping Intake Port Holes in Crankcase, Rear Section, of Nine-Cylinder Whirlwind Engine

Tap eight ⅜ in.-16P USSF ⅞ in. deep.
Index and repeat for total of nine pads.

Next, the bolt bosses are machined on a drill press to 5 7/16 in. diameter at cylinder pads 4, 5, 6 and 7. The next process is to drill, spotface, chamfer and tap the lifting boss and oil-strainer housing, using a radial drill:

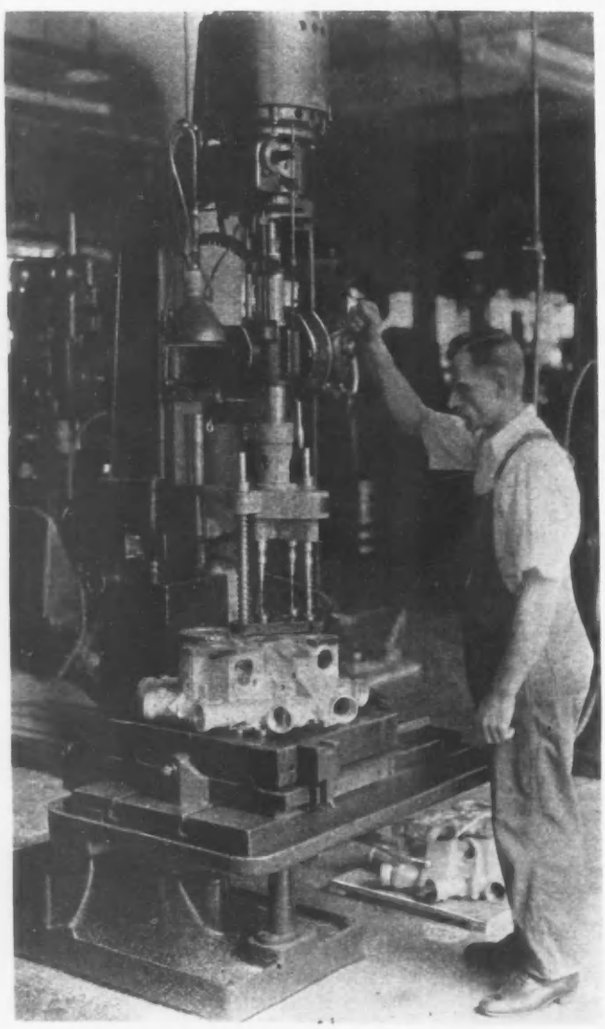
Drill 21/32-in. diameter hole in lifting eye boss 11/16 in. deep.
Spotface 1¼ in. diameter to 9¼ in. dimension from center.
Chamfer 1/16 in. x 45-deg.
Tap ¾ in.-10P USSF 9/16 in. deep full thread.
Index and repeat operation on other hole.
Index.
Drill 1 11/32-in. diameter hole in oil-strainer housing.
Redrill to 1.543 ± 0.003 in. diameter through outside wall only.
Counterbore to 1 15/32 in. diameter x 1/16 in. deep.
Chamfer outer wall 1/16 in.-45-deg.
Tap 1⅝ in.-12P USSF thread.

A 30-deg. angle hole is then bored and drilled, with the casting on the table of a drill press, and a 9/16-in. hole is bored and drilled, as follows:

Bore ⅝-in. diameter hole ½ in. deep at 2 23/32-in.

dimension, using ⅝-in. diameter two-lip end mill, holding 30-deg. angle.
Drill ⅝-in. diameter hole 1 in. deep at 2 23/32-in. dimension, holding 30-deg. angle.
Bore 9/16-in. diameter hole ½ in. deep at 8 31/32-in. dimension, using 9/16-in. diameter two-lip end mill.
Drill 9/16-in. diameter hole at 8 31/32-in. dimension.

Using a sensitive radial drill two 45-deg. stud holes are drilled and tapped, following which the outer boss



Drilling Magneto Pad Holes in Crankcase, Rear Section, Nine-Cylinder Engine. Note threading on inside of intake ports

holes are drilled, primed, reamed and tapped with the sensitive radial drill, in the following manner:

Drill two "F" (0.257-in.) diameter holes in 45-deg. face through.
Tap two 5/16 in.-18P USSF to gage.
Drill 7/32-in. diameter hole through outer boss with standard drill.
Redrill 7/32-in. diameter hole, breaking through into 3.703-in. hole.
Redrill 7/32-in. diameter hole to "F" (0.257-in.) diameter x ⅜ in. deep.
Remove jig.
Line ream 0.232 ± 0.001-in. and 0.242 ± 0.001-in. diameters.
Tap 5/16 in.-18P USSF 5/16 in. deep.

A 15-deg. oil hole is drilled with a sensitive radial drill to ¼-in. diameter and 3 19/32 in. deep.

Continuing with a sensitive radial drill, eight ⅜-in. diameter oil drains are drilled through four ribs on the inside of the crankcase. The 1⅝-in. diameter flange clearance is formed with the radial drill to 1 33/64-in. dimension from rear section flange.

Fourteen mounting flange holes ¾ in. deep are tapped with a tapping machine. After the piece is placed on the table, the 5/16-in.-18P USSF holes are tapped in front section mounting flange.

With a back spotfacing machine 20 mounting bosses are back spotfaced to ¾ in. diameter and ½ in. dimension.

A keyway is then slotted with a vertical slotter to 0.313 ± 0.001 in. wide and to 3.843 + 0.003 — 0.000 in. depth from opposite face of bore, holding 1/16-in. radii in corners.

Using a sensitive radial drill, an oil hole is drilled, counterbored and reamed:

Drill 7/64-in. diameter hole breaking into 0.232 ± 0.001-in. diameter hole.
Counterbore 9/32 in. diameter x 1/16 in. deep.
Ream to 0.123 ± 0.001 in. diameter.

Vent holes are then drilled, on the bench, in all ⅜-in.-16P stud holes which are not drilled through. The crankshaft bearing hub is finish faced on a 36-in. Bullard to 2.312 ± 0.002 in. from face of flange. The crankshaft hub is then finish faced to 1.000 ± 0.002 in. dimension, also on a 36-in. Bullard.

The crankcase is then taken to the bench, where all sharp edges caused during machining operations are removed, such as ends of threads or sharp edges of drilled or bored holes projecting on the inside of the crankcase. All cored and drilled oil passages are inspected and cleaned if necessary. Threaded holes are inspected and retapped if necessary.

Next the crankcase is washed and cleaned thoroughly in a tank, after which it is primed with a first coat of metal primer on the outside of the casting, using an air drying primer. Following this, sandpapering is done if necessary, and then the finish coat of enamel is applied and dried in air.

The crankcase is now ready for inspection, after which it is delivered to finished stock.

High Elastic Limit Steel for Ships

Ship plate and shapes heat treated for high elastic limit are being used by Alfred Holt & Co., the British shipping firm, for the entire stress-carrying portion of their newly built ships. The extra strength allows the dimensions to be reduced an average of about 12 per cent, a clear gain for the cargo capacity. Similar material is also being used for part of the superstructure of a very large liner being built for the Canadian Pacific, in order to increase the stability.

According to P. G. Rouse, writing in the *Engineer*, July 19, this steel is called "Martinel," or "Martin Elastic Limit Steel," after its proponent, F. G. Martin. It is a "special quality steel subjected after rolling to a special heat treatment which insures the formation of the micro structure most favorable to the greatest elastic limit." Micrographs are given, showing the well known banded structure of ordinary mild steel as rolled, and a fine grained mixture of pearlite and ferrite, with small traces of banding, said to be characteristic of Martinel steel. Physical properties quoted are:

	Ordinary Mild Steel	Martinel Steel
Elastic limit, lb. per sq. in.		
Minimum	9,000	33,000
Maximum	31,000	45,000
Average	19,000	37,000
Average ultimate strength	65,000	72,000
Elongation, per cent		20 to 30

Metal Exposition Opens Sept. 9

Cleveland Show Will Contain Exhibits of 250 Companies in Treating, Welding, and Making Metals— Five Societies to Hold Meetings

NEARLY 250 companies are to present exhibits at the National Metal Exposition in the Public Auditorium, Cleveland, Sept. 9 to 13, in connection with the National Metal Congress. Under the auspices of the American Society for Steel Treating, which is holding its eleventh annual convention at that time, four other societies also have arranged for technical meetings and for participation in the exposition: American Welding Society, institute of metals and iron and steel divisions of the American Institute of Mining and Metallurgical Engineers and the iron and steel division of the American Society of Mechanical Engineers.

On the following pages there is presented a list of the exhibitors, covering what each will display, who will be there and so on. In addition, there will be found illustrations of some of the special equipment which will be featured among the exhibits. There are also reproductions of photographs of 16 of the chairmen of the 37 chapters of the A.S.S.T.

On other pages will be found five special articles on heat treating and related subjects. These are offered as a contribution to parallel the stupendous efforts of the A.S.S.T. to signalize the continued advances in an industrial technology of the first magnitude.

List of Exhibitors and Their Products

A

Abrasive Co., Philadelphia. Booths 342 and 396.
Featuring Red Center snagging wheel for grinding steel castings; showing abrasive wheels of Borolon, S. B. Borolon and Electrolon in various sizes, shapes, grains and grades for such operations as cylindrical grinding, surface grinding, tool and cutter grinding, internal grinding and cutting off work. Borolon Grain for use in drawing die molds. Represented by: S. M. Hershey, sales manager; John F. Guthrie, W. A. McMillan, I. R. Blair, R. A. Shaffer, vice-president; and J. F. Fischer, assistant sales manager.

Air Reduction Sales Co., New York. Booths 252 and 331.
Airco 99.5 per cent oxygen and Airco acetylene in cylinders; Airco-Davis-Bournonville oxygen discharge manifold; Airco-Davis-Bournonville welding and cutting torches, regulators and supplies; Airco national carbide; No. 4-A Oxygraph; New No. 4 Camograph. Represented by: S. P. Fetter, G. J. Dekker, H. L. Rogers, F. E. Rogers, T. M. Hamer, C. A. Daley, R. F. Helmkamp, F. J. Maeurer, and G. Van Alstyne.

Ajax Electrothermic Corporation, Trenton, N. J. Booth 399.
Model of a 500-lb. coreless induction furnace; polished section of ingot made in high frequency induction furnace by Heppenstall Forge & Knife Co.; two small laboratory coreless induction furnaces; moving picture showing high frequency (coreless) induction furnaces in operation; and photographs of installations. Represented by: Dudley Willcox, treasurer and assistant general manager; and Robert N. Blakeslee, secretary and sales manager.

Allegheny Steel Co., Brackenridge, Pa. Booth 70.
Heat and corrosion resisting Ascoloy and Allegheny metal with examples of completed installations; semi-finished samples of Allegheny metal and Ascoloy material in process of fabrication into parts of various types of equipment. Represented by: O. M. Otte, F. S. White, and Banks E. Eudy.

Edgar Allen Steel Co., Inc., New York. Booth 284.
Imperial Major high speed steel; extra special high speed steel; special high speed steel; turning and finishing steels; Minerva air hardening steel; self hardening steel; special chisel steel; red label steel; tack knife steel; die casting steel; solid double six production steel; hollow double six production steel; Class P tool steel; class E tool steel; Stag tool steel; Talon tool steel. Represented by: Henry Sears Hoyt, president; J. King Hoyt, Jr., secretary and treasurer; V. A. Green, vice-president and general manager; C. K. Everitt, managing director Edgar Allen & Co., Ltd., Sheffield, England; E. R. Carnell, director; H. R. Adams, and R. M. Brushingham.

Allied Products Corporation, Detroit. Booth 274.
Victor Peninsular Division, cold-headed products; Indiana Lamp Division, automotive lighting equipment; and Richard Brothers Division, replaceable and interchangeable punches and dies. Represented by: T. S. Higbee and J. E. Gladden.

Aluminum Co. of America, Pittsburgh. Booths 334, 335, 336, 337.
Ingots; forgings; permanent mold castings; sand castings; die castings; magnesium products; wire; rod; bar aluminum; tubing; conduit; pipe fittings; streamline tubing; aluminum foil; seals and caps; electrical conductors; transmission cable; collapsible tubes; extruded molding and structural shapes; shingles; downspouts; gutters; flashings; corrugated roofing; radio parts of aluminum; beams; window sash; carpet frames; aluminum doors; screw machine products; aluminum paint and bronze powder; welded chemical vessels; permanent mold cast and stamped cooking utensils; equipment for demonstrating the deflection of aluminum and steel; aluminum chairs; ladders; waste-baskets; and costumers, etc. This exhibit is comprehensive and attempts to trace the manufacture of aluminum from the crude ore to the finished product. Represented by: F. C. Shoupe and others.

American Brass Co., Waterbury, Conn. Booth 235.
Charles Gallo, welding expert, will demonstrate Tobin bronze and other Anaconda copper alloy welding rods; display of Everdur metal, a copper-silicon-manganese alloy; collection of various iron and steel pieces welded with Anaconda copper alloy welding rods. Represented by: W. H. Dowd, W. C. Swift, T. S. Foote, H. M. Paxon, G. E. Newton, and C. G. Goodman.

American Car & Foundry Co., New York. Booth 318.
No. 3 three-electrode heater for heating rivets; No. 3 one-electrode two-path heater for heating material for forging or upsetting. Represented by: F. C. Cheston, John S. Helt and Harold C. Cheston.

American Electric Furnace Co., Boston. Booths 402 and 439.
Model HB-1, 8 x 16-in. high speed furnace and B-2, 12 x 24-in. box furnace will be in full operation, showing the patented atmospheric control feature. The following models are also on exhibition: P-3, 12-in. pot furnace; P-7, 16-in. pot furnace; 18-in. tilting pot furnace; and nitriding furnace. Represented by: K. A. Juthe, president; S. N. Juthe, vice-president; A. J. Hanson, chief engineer; John C. Juthe, sales manager; A. B. Beach, E. E. Bolds, A. A. Anderson, A. D. Heath, L. A. McCalla, L. A. Smith, W. P. Barba and W. T. Haggas.

American Engineering Co., Philadelphia. Booth 398.

E. C. BAIN
Chairman
New York Chapter

R. E. SHERLOCK
Chairman
Buffalo Chapter

American Gas Association, New York. Gas Section.
Industrial gas section is again sponsoring a combined exhibit of the leading manufacturers of industrial gas furnaces and accessory equipment. The equipment being displayed by each of these manufacturers is described elsewhere. A control laboratory is being operated under the direction of W. E. Jominy, research fellow of the association at the University of Michigan. Represented by: E. D. Milener, industrial research representative and C. W. Berghorn, secretary industrial gas section of the American Gas Association; A. M. Apmann, chairman, and Karl Emmerling, vice-chairman, committee on display and contact with national industrial organizations; and J. C. Shanks, industrial gas representative, East Ohio Gas Co.

American Gas Furnace Co., Elizabeth, N. J. Gas Section.
Continuous rotary retort heating machine for hardening, annealing or tempering bolts, rivets, chain links, pins of various kinds; mesh wire conveyor heating machine; reciprocating hearth heating machine for hardening and annealing all kinds of small and medium sized articles, such as flat and coil springs, stamped and pressed metal parts; heating machine for tempering, temper coloring, gun metal finishing and all work requiring temperatures below 1000 deg. Fahr.; melter for gold and silver, also for coal ash fusion point determination; rotary brass melter; high speed oven furnace; large oven furnace for heat treating; rotary retort; carburizer; vertical retort gas carburizer. Represented by: P. C. Osterman, vice-president; Elmer C. Cook, Theodore Farwick, Sr., John Mehrman, William H. Kelsey, William J. Barenscheer and O. T. Muehlemeyer.

American Steel & Wire Co., Chicago, New York and Cleveland. Booth 265.
Premier-tested welding wire and rods in various grades for use in practically every welding need in the electrical and gas field; cold-rolled strip steel; springs; screw stock; coated and plain wire nails; and various manufacturing wires. Represented by: F. Connell, G. S. Rose, A. G. Bussman, W. E. Mackley, E. S. Humphrys, C. J. McGregor, R. C. Fisher, W. H. Cordes, E. E. Louis, A. T. Merriman and P. G. Gilroy.

Ampco Twist Drill Co., Jackson, Mich. Booth 312.
Two Melling Mill-Drill-Matics in operation; milling, drilling, reaming and burring standard S.A.E. 5/16-in. yoke ends at a production speed; also drill display board showing the complete line of small tools manufactured; new patented mandrel which is being marketed under the trade names of 4 in 1. Represented by: O. Monrad, president; E. Loy, secretary and general manager; E. Leypoldt, R. Rice, D. O'Brien, Fred E. Kelley, F. J. Sikorovsky, George Melling.

Anchor Drawn Steel Co., Latrobe, Pa. Booths 10, 12, 39 and 41.
Gold Anchor drill rod; Blue Anchor carbon steel drill rod; Red Anchor carbon steel drill rod; and special cold drawn shapes of high speed, stainless, carbon and alloy tool steels. Represented by: R. C. McKenna, president; Floyd Rose, vice-president; and George Morrison.

Armstrong-Blum Mfg. Co., Chicago. Booth 383.
Marvel metal band saw; Marvel automatic high speed saw; Marvel hack sawing machines; two entirely new hack saw machines, Marvel Nos. 6 and 6-A shown for the first time. Marvel high speed edge hack saw blades. Represented by: Harry J. Blum, secretary; Stanley A. Woleben, Joseph C. Fletcher, Walter S. Ryan, Allan M. Andrews, Harry A. Welch and John E. Van Doren.

Armstrong Brothers Tool Co., Chicago. Booth 381.
Lathe, planer and shaper tools; drop forged lathe dogs; clamps; ratchet drills; drilling posts; drop forged wrenches; stocks and dies; pipe vises; pipe cutters; pipe wrenches and machine shop specialties. Represented by: Paul L. Armstrong, A. Arbogast, George Nufer and W. Welter.

Armstrong Cork & Insulation Co., Lancaster, Pa. Booth 98.
Armstrong's corkboard insulation for cold storage and constant temperature rooms and for the walls and roofs of buildings; Armstrong's cork covering for the insulation of low temperature lines and tanks; Armstrong's insulating brick and Nonpareil insulating brick for the insulation of boiler settings, heat treating furnaces and other high temperature furnaces, ovens, kilns, etc., Armstrong's cork machinery isolation for sound deadening and vibration absorption under machines. Represented by: H. B. Gates.

Automatic Nut-Thread Corporation, Philadelphia. Booth 304.
No. 3 Threadnut automatic nut tapping machine, newly redesigned; No. 2 Threadnut automatic nut tapping machine, newly re-designed with cabinet base; and No. 1 Threadnut hand operated tapping machine, using bent shank tap and continuous tapping. Represented by: Erie M. de Sherbinin, president; Robert B. Webster, secretary-treasurer; Christian S. Sorensen, general manager; Fred D. Creasop, Victor E. Pearson, Joseph T. Ramella.

Automatic Temperature Control Co., Inc., Philadelphia. Booth 351.
Two balancing three-position controllers with anticipating features; one three-position single motor controller; one two-position single motor controller; three-position slow motion controller operating 8-in. air and 1-in. oil valves. A proportional hand control operating oil and air valves as a unit; a self-cleaning oil valve with adjustable orifices designed for hand operation; an electric heater controller designed to save power as compared with rheostat operation of small electric furnaces; a time lag relay. Represented by: G. S. Frazee, Ivan Johanson, R. A. Smart and J. D. Andrews, sales manager.

B

W. O. Barnes Co., Inc., Detroit. Booth 406.
Hack saw machine (motor driven) using Barnes red arrow high-speed steel hack saws, cutting different metals. Represented by: W. O. Barnes, president; J. H. Flavell, secretary-treasurer; F. M. Shaw, eastern sales manager; Roy Schindley, A. G. Young, J. M. Munro, C. B. Cecil, western sales manager; L. Robertson, manager, W. Robertson Machine & Foundry Co.

Bastian Blessing Co., Chicago. Booth 239.
Oxyacetylene welding and cutting torches and regulators; oxygen and acetylene manifolds; acetylene generator; high pressure forged fittings; drum valves and accessories; featuring oxyacetylene welding as applied to piping systems. Represented by: E. L. Mills, sales manager; E. N. Stevens, assistant sales manager; and Earl M. Evleth.

Bausch & Lomb Optical Co., Rochester, N. Y. Booths 7 and 9.
Wide field binocular microscope suitable for viewing opaque specimen; magnifiers and readers; microtomes; colorimeters and other optical and measuring instruments; toolmaker's microscope; photomicrographic and projection apparatus; metallographic equipment. Represented by: I. L. Nixon, M. H. Stevens, H. L. Shippy and A. R. Farmer.

Bell & Gossett Co., Chicago. Booths 344 and 345.
(See Case Hardening Service Co. listing.)

Bellis Heat Treating Co., Branford, Conn. Booth 352.
Lavite & Lavite furnaces; electric furnaces tempering Lavite, for tempering temperatures 270-1200 degrees Fahr.; carbon Lavite, for hardening and annealing temperatures 1000-2000 degrees Fahr.; high speed Lavite, for temperatures 2000 to 2500 degrees Fahr. Represented by: A. E. Bellis, president; C. E. Wister and J. W. Black.

Bellevue Industrial Furnace Co., Detroit. Booth 393.
Twenty-five kw. electric furnace for hardening and carburizing, also preheating of high-speed steel, 1600 to 1800 deg. Fahr.; 40 kw. high temperature furnace for hardening high-speed steel, equipped with Globar non-metallic heating elements for 2450 deg. Fahr. Represented by: Walter E. Hinz, president; Louis J. Raymo, sales manager; and Arnold Pfau, Jr.

Bethlehem Steel Co., Bethlehem, Pa. Booths 44, 46, 65 and 67.
Airplane steels; forgings; test specimens pertinent to airplane

engine building; tool steels; Mayari iron; Silvery Mayari; sheets and structural sections. Represented by: T. F. Fitzgibbons, F. H. Baldwin, J. H. Bateman, E. A. Buxton, G. P. Witteman, H. R. Weeman, D. C. Roscoe, H. W. Hibshman, W. E. Titus, R. S. Tucker, H. E. Graffin, G. Cushman, J. W. Codding, F. E. Fisher, R. MacDonald, W. B. Pritchard, W. R. Shimer, J. H. Stoll, A. P. Spooner, P. E. McKinney and J. F. Gaffney.

Binghamton Flexible Shaft Co., Binghamton, N. Y. Booth 365.

Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo. Booth 72.
Cold drawn steel, turned and polished shafting, turned and ground shafting and special finished steel. Represented by: Walter R. Howell, vice-president and general manager; W. P. Mitchell, general sales manager; C. L. Huff, George Spaulding, C. H. Beach and T. D. Taylor.

Botfield Refractories Co., Philadelphia. Booth 210.
Adamant fire brick cement; Adachrome fines; Adachrome aggregate; Adamant gun; and Adapatch. Represented by: A. H. Engstron, sales manager; and W. B. Smith.

Bourne-Fuller Co., Cleveland. Booths 25 and 27.
Specimens of steel sections rolled in alloy and carbon steels, bolts, nuts and rivets—standard and special for aircraft, automotive, railroad and other industries. Represented by: H. H. Pleasance, C. F. Newpher, N. C. Bolton, R. C. Klemm, H. D. Burket and R. D. Titus.

Bristol Co, Waterbury, Conn. Booth 386.
Bristol's pyrometer controller, indicating pyrometer, recording pyrometers and all types of automatic temperature control equipment; new line of automatic temperature controller, including motor valves for gas, oil, air and steam, of the floating type; special pyrometer controller for automatically controlling hot blast temperatures on blast furnaces in operation; Bristol safety set screws and belt lacing. Represented by: H. L. Griggs, general sales manager; R. M. Walker, H. W. Moss, L. G. Bean, E. L. Stillson, Mr. Trumbull and W. F. Emery.

Brown Instrument Co., Philadelphia. Booth 272.
Pyrometers, indicating, recording, controlling, signalling; flow meters, indicating and recording; thermometers, recording and controlling; CO_2 meters, indicating and recording; pressure gauges, recording and controlling; automatic control valves; and thermocouples and protecting tubes. Represented by: R. P. Brown, president; C. H. Kerr, vice-president and general manager; G. W. Keller, vice-president and general sales manager; J. P. Goheen, secretary; G. W. W. Cornman, treasurer; O. B. Wilson, G. L. Clapper, J. L. Whitten, L. C. Wilson and H. G. Hoffman.

Brown Lynch Scott Co., Monmouth, Ill. Booth 388.
New style carburizing compound cleaner and grader. Represented by: J. A. Scott, secretary and general manager; W. B. Lynch and S. W. Perry.

C

Calorizing Co., Pittsburgh. Booth 324.
Calite alloys—group of miscellaneous castings used in the heat treating trade such as carburizing boxes, cyanide pots, hearth plates, rollers for continuous furnace operation, etc.; Calorized steel parts such as oil still tubes, cyanide and salt pots, pyrometer protection tubes, bolts and nuts, etc. Represented by: B. J. Sayles, president and general manager; D. T. Downes, chief engineer; H. Schultz, N. E. Ward, R. S. Brown and N. A. Milmine.

Andrew C. Campbell, Inc., Bridgeport, Conn. Booth 403.
Three Campbell nibbling machines, actually doing work of cutting metal of varied thickness, etc. Represented by: H. R. Powell and J. Johnson.

Carboloy Co., Inc., New York. Booths 255 and 325.
A Warner & Swasey No. 3A universal hollow-hexagonal turret lathe equipped throughout with Carboloy cutting tools and operated at high production speeds and output on various steels, irons, bronzes, and other materials; a large exhibit of Carboloy tools of various shapes and styles. There is also exhibited Carboloy wire drawing dies and specimens of drawn wire. Represented by: P. R. Mallory, president; E. H. Wilkinson, vice-president; A. R. Howell, sales manager; G. V. Rockey, G. N. Sieger, and Zay Jeffries, A. A. Merry, W. G. Robbins, W. W. Fullager, W. J. Lindner, P. Petroff, W. H. Martin and W. S. Huson.

Carborundum Co., refractory division, Perth Amboy, N. J. Booths 347 and 387.
Complete assortment of standard shapes of refractory materials (Carbofrax and Aloxite) including brick, tile and special shapes; Infrax insulating brick and high temperature refractory cements; silicon carbide grain and Carborundum firesand; Globar-equipped electric furnace; Carbo-

E. C. SMITH
Chairman
Canton-Massillon Chapter

H. S. BINNS
Chairman
Cincinnati Chapter

radiant chamber. Represented by: W. M. Smith, sales manager furnace department; R. A. Beverly, S. A. Fenno, J. A. King, R. A. Barr, and W. C. Thiess.

Carborundum Co., Niagara Falls, N. Y. Booths 347, 387, 346 and 389.
Abrasive Division—Complete line of Carborundum and Aloxite wheels in Redmanol and rubber bonds; Globar Division—Globar furnace and Globar heating elements and terminals. Represented by: S. F. Courter, general sales manager; G. W. Chormann, B. H. Work, E. C. Christensen, W. C. Parrott, H. W. Collinson and J. C. Rice.

Carpenter Steel Co., Reading, Pa. Booth 81.
Carpenter stainless steel No. 5. Represented by: F. A. Bigelow, president; J. H. Parker, vice-president; R. V. Mann, F. R. Palmer, B. H. DeLong, G. V. Luerssen, P. B. Greenawald, G. H. Edmonds, W. M. Loos, C. A Heil, R. L. Williams, K. L. Crickman, V. W. Gardner, H. G. Roodhuyzen, J. S. Bailey, C. H. Breed and E. von Hambach.

Case Hardening Service Co., Cleveland. Booths 344 and 345.
Hardening room materials and equipment: Bohnite; Caseite; Cyanide; Drawite; Bathite; Ni-Cro-Al, nickel-chromium-aluminum alloy pots and boxes; Cleancoat; Non-Case; pressed steel pots; B and G oil coolers; Hevi-Duty electric furnaces in operation. Represented by: W. C. Bell, president; E. J. Gossett, vice-president; J. S. Ayling, sales manager; and B. C. Cleveland.

Central Alloy Steel Corporation, Massillon, Ohio. Booths 14, 16, 43 and 45.
Applications of Agathon Alloy steels; Toncon copper-molybdenum iron; Enduro Nirosta steel; and Agathon Nitralloy. Represented by: B. F. Fairless, president; J. M. Schlendorf, vice-president in charge of sales; W. M. Garrigues, general sales manager; M. J. R. Morris, F. L. Gibbons, A. Schaeffer and D. B. Carson.

Char Products Co., Indianapolis. Booth 377.
Full line of carburizing compounds and carbon products giving particular attention to the unusual physical properties of some of the products. Demonstrating the non-burning qualities of the non-burning type of Char carburizers and the resistance of this type of material to abrasive action. Represented by C. Q. Swenson, C. B. Edwards, and William Higburg, sales manager.

Chemical Rubber Co., Cleveland. Booth 283.
Laboratory equipment. Represented by: A. Friedman, president; E. Hartle and I. W. Brandel.

Chicago Steel & Wire Co., Chicago. Booths 315 and 317.

Chicago Steel Foundry Co., Chicago. Booths 285 and 287.
Chrome-nickel alloy castings for use at high temperatures; boxes; pots; and furnace parts; sheet alloy fabricated parts; special high strength chrome-nickel castings. Represented by: David Evans, president; C. M. Evans, assistant to president; Herman Georgen, sales manager; J. W. Frank, William J. Chapin, Gordon McMillan.

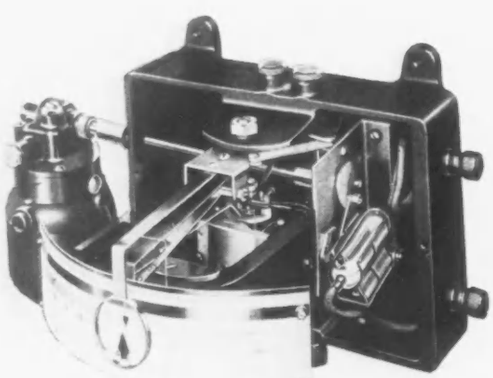
Chrobaltic Tool Co., Michigan City, Ind. Booth 204.
Heat resisting and acid resisting castings, including Fire Armor and Zorite alloy. Represented by: W. B. Sullivan,

Heat-Treating Furnaces

A COOL front furnace, as produced by the W. S. Rockwell Co., 50 Church St., New York, will be on exhibition at the company's booth at the National Metal Exposition. A battery of such furnaces is here illustrated. The cool front serves to provide improved working conditions and better heating results over a wide range of heat-treating operations.

A New Mild Steel Electrode

MARKETED as the new Yellow Jacket electrode, the Fusion Welding Corporation, 103rd Street and Torrence Avenue, Chicago, will exhibit at the National Metal Exposition details of this new product and some of its results. It is designed to throw a preponderance of heat into the work, producing what welders call extremely deep penetration. Its field of application is heavy welding, such as structural welding, heavy pipe, etc. The accompanying illustration shows pipe welded with this electrode in a wide excavation.

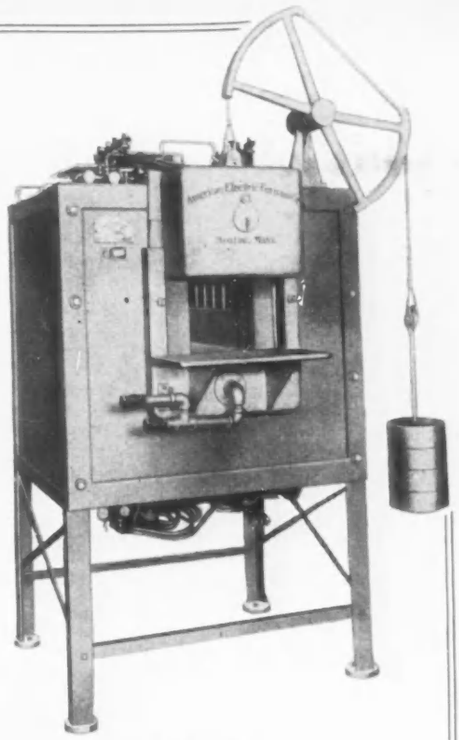


A New Control Pyrometer

AS the opening gun of a campaign announcing a development of large importance to all steel treaters the Republic Flow Meters Co., Chicago, will exhibit at the National Metal Exposition a control pyrometer which eliminates the use of auxiliary relays.

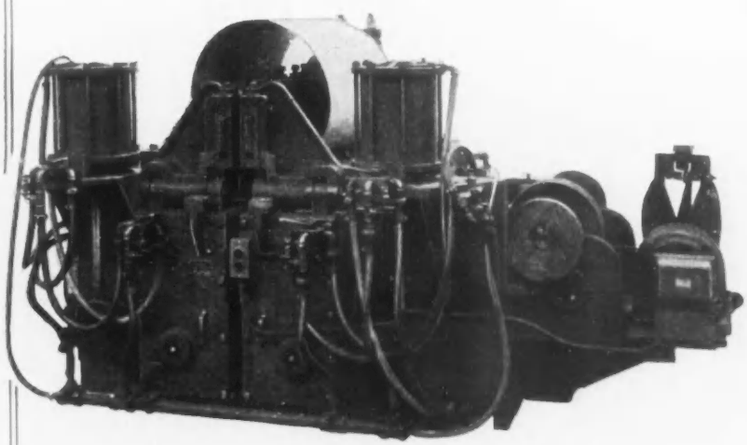
Electric High-Speed Furnace

AT the booth of the American Electric Furnace Co., Boston, the furnace illustrated will be in operation, as well as one of the company's box furnaces. This high-speed furnace is known as Model HB-1 and is 8 in. by 16 in. The high-speed furnaces are designed to eliminate direct intense radiation and have automatic control.



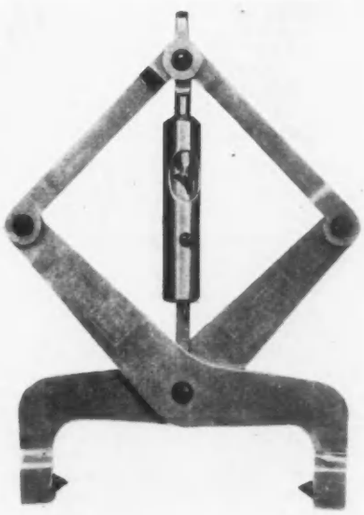
Barrel Welder

A WELDER for the flash butt welding of the seams of steel barrels has been developed by the Federal Machine & Welder Co., Warren, Ohio. The illustration shows it in operation. It is rated to weld a seam 40 in. long in No. 12-gage metal and, by means of a regulating coil, to weld the same length seam equally well in No. 24, or any intermediate gage. It can handle barrels or tanks from a minimum diameter of 14½ in. at a rate of 60 to 100 an hour.



Electric Heat-Treating Furnace

ONE of the new furnaces, brought out by the Century Co., Taunton, Mass., No. 3 Model HS furnace, is here illustrated. It will be exhibited at the company's booth during the National Metal Congress. Temperatures for which it is rated range between 1200 and 2400 deg. Fahr. Features include the manner of wall insulation, door construction and terminal design.



Tongs Without Any Parts

THE tongs here illustrated, for hot and cold steel ingots, molds, slabs, etc., and for handling large bales, are made by the Heppenstall Forge & Knife Co. of Pittsburgh, from heat-treated alloy steel. They can be suspended from a hoist by single rope by means of which they are manipulated. They can also be operated by the crane man.

vice-president and general manager; L. H. Whiteside, C. M. Conner, J. F. Sweeney, A. A. Cash, O. G. Voss, T. A. Meyer, Charles Peterson, H. Klouman, E. Whiteside.

James Clark, Jr., Electric Co., Louisville, Ky. Booth 365.

Clark Tructractor Co., Battle Creek, Mich. Booth 102.

Clark 5-ton Truclift, gas powered industrial lift truck; Clarktor Tructractor, 4-wheeled, gas powered factory tractor, equipped with self-starter, generator, lights, etc.; Clarkat Tructractor, 3-wheeled, small tractor with turning radius of 51 in.; Whale auto end dump Tructractor, capacity 30 cu. ft. or two tons. Represented by: C. E. Staninger, Everett M. Sharp, R. J. Burrows, president; C. I. Ucker, G. A. Smith, special representative.

Cleveland Twist Drill Co., Cleveland. Booths 408, 409, 425 and 427.

Two high speed drill presses demonstrating Cle-forge high speed drills at various speeds and feeds; complete display of tools including high-speed drills and reamers tipped with tungsten carbide. Represented by: W. E. Caldwell, J. B. Dillard, H. P. Jenson, H. G. Smith, W. C. Weidig, G. Burkhardt, Alfred Jacquin, T. F. Mummery, H. E. Bergquist, Thomas Thomas, E. P. Horan, I. P. Farnum, R. D. Boltey, D. D. Burdett, C. F. Petzinger, T. Skove.

Climax Molybdenum Co., New York. Booth 4.

Molybdenum in all forms. Represented by: B. F. Phillipson, president; J. B. Thorpe, assistant to president; W. P. Woodside, J. Kent Smith, H. P. Furlong, R. L. Rolf, George O. Loeffler, Alan Kissock.

Clipper Belt Lacer Co., Grand Rapids, Mich. Booth 80.

Clipper belt lacers, all models, including the new Clipper speed lacers, Clipper belt cutters with safety features, Clipper belt hooks, electrically operated Clipper ship. Represented by: Earl H. Forsyth.

Coats Machine Tool Co., Inc., New York. Booth 29.

Complete line of Krupp Mikrotast gages made by the Krupp Steel Works of Germany, for internal and external gaging; light contact Krupp Mikrotast for gaging fine wire exhibited for the first time in United States, Krupp Mikrotast grinding gages for use on cylindrical grinders while in operation. Represented by: Charles E. Coats, treasurer.

Colonial Steel Co., Pittsburgh. Booths 10, 12, 39 and 41.

Ohio, a new high-carbon high-chromium air hardening die steel; Colonial No. 7, a special carbon-vanadium crucible-made tool steel; Red Star, a carbon tool steel; stainless irons and steels; high-speed, alloy and carbon tool steel sheets; high-speed, alloy and carbon tool steel rings, disks and special forgings; copper-clad, ground rods and line material; hot rolled special shapes; plow steel, soft center; jail bar and safe steel; mining drill steel, solid and hollow; special die blocks. Represented by: R. C. McKenna, president; Floyd Rose, vice-president; Lawrence Wood, sales manager; J. P. Gill, N. B. Hoffman, H. M. Bray, George Morrison, F. L. Stevenson, R. W. Harris, Charles Schnibbe.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. Booth 437.

Two types of Colt Autosan. A two-tank conveyor machine as furnished for a nationally known bearing manufacturer, embodies many outstanding Colt Autosan features. Represented by: George Webb, H. S. Seiferman, C. M. Jackson, G. E. MacMannus, F. R. Murphy.

Columbia Tool Steel Co., Chicago Heights, Ill. Booth 62.

Alloys, tool steel, ingots, etc. Represented by: Arthur T. Clarage, president; G. C. Beebe, W. G. Sonderman, E. D. Roberts, E. W. Luecht.

Crucible Steel Co. of America, New York. Booths 38, 40, 42 and 63.

Corrosion-resisting articles, indicating the possibilities of this type of material for various purposes. Represented by: B. F. Hufnagel, president; J. A. Mathews, A. T. Galbraith and J. M. McComb, vice-presidents; H. L. Gellinger, auditor; R. Michener, general sales agent; R. E. Christie, assistant general sales agent; J. P. Jayme, E. P. Gaffney, R. H. Heatley, F. E. Phelps, R. W. Crane, M. S. Dravo, R. C. Webster, J. T. Carroll.

D

Dardelet Threadlock Corporation, New York. Booth 276.

Vibrating machine; bolt threader; nut tapper; test specimens; samples of taps and dies; exhibition of various uses of the Dardelet thread; samples of nuts and bolts. Represented by: A. Morris Thomson, vice-president; Charles J. Gass, Major William E. Hoke, Norman C. McLoud.

Darwin and Milner, Inc., Cleveland. Booths 66 and 87.

Full line of tool steels with specimens of dies and samples of work done; cast dies, etc., made from patent Cobaltcrom steel; full line of magnets made from cobalt magnet steel; hacksaw blades; other special steels, etc., from English works, Darwins, Ltd., Sheffield, England; Darwin safety razor blades made from patent Cobaltcrom tool steel. Represented by: Victor F. J. Tlach, John C. Koch, Harry L. Harrison, C. F. Lear, Max Opp, Herman O. Baberadt, H. J. Burnett, C. A. Bowman, H. R. Bowman, Jr.

H. B. KNOWLTON
Chairman
Fort Wayne Group

GEORGE M. NAUSS
Chairman
Washington-Baltimore Chapter

Dearborn Chemical Co., Chicago. Booth 92.

Samples and literature pertaining to No-Ox-Id rust preventive; Dearborn cleaners; Dearborn feed water treatment. Represented by: E. M. Converse, C. A. Remsen, J. A. Crenner, C. I. Loudenback, E. H. Ruhlman.

A. P. De Sanno & Son, Philadelphia. Booth 376.

Radiac cut-off machines for cutting materials with the use of an abrasive wheel; No. 1 machine for solid stock up to 1¼ in. in diameter; No. 1A machine for solid stock up to 2 in. in diameter. Represented by: A. P. De Sanno, Sr., Alphonso De Burnay, Benjamin G. Hardy, L. C. Buckingham.

Detroit Alloy Steel Co., Detroit. Booth 326A.

Wood patterns used in manufacturing Dasco alloy tool castings; Dasco alloy tool steel castings as cast; and pressed metal dies made of Dasco alloy tool steel. Represented by: Hugh Martin, president; H. H. Wyatt, secretary-treasurer; H. F. Kluender and W. A. Spindler.

DeWalt Products Corporation, Leola, Pa. Booth 320.

DeWalt "Wonder-Worker," a portable electric woodworker for maintenance and general construction, also for specialized woodworking operations such as cross-cutting, ripping, dadoing, mitering, tenoning, shaping, etc.; DeWalt "Wonder Metal Worker," the new circular saw method of cutting seamless and welded steel tubing and formed metal products; DeWalt jointer, a 6-in. jointer with 44-in. table. Represented by: Paul Gardner, president; Robert H. Mulch, general sales manager; L. J. McLaughlin, J. C. Mann.

Donner Steel Co., Inc., Buffalo. Booth 412.

Cold drawn bars and die rolled parts. Represented by: W. F. Vosmer, vice-president; A. G. Greenamyer, general superintendent; C. A. Cherry, assistant to vice-president; D. G. Baxter, assistant general superintendent; R. E. Sherlock, W. C. Peterson, L. C. Miller, F. H. Lammert, P. M. Guba, H. C. Richardson, E. D. Pumphrey.

Driver-Harris Co., Harrison, N. J. Booths 64 and 65.

Nichrome castings, retorts, carburizing boxes, pots, pyrometer tubes, furnace parts and other castings for heat resisting purposes; Nichrome B for addition to cast iron; Nichrome sheet carburizing containers; samples of intricate castings made of Nichrome; Nichrome wire for use as elements in industrial furnaces and other heat-resisting applications. Represented by: F. L. Driver, Jr., president; S. M. Tracy, treasurer; Harry D. McKinney, general sales manager; G. A. Lennox, assistant sales manager; W. E. Blythe, L. H. Waldrip, J. C. Bilek, J. C. Henderson, J. B. Shelby.

Duraloy Co., Pittsburgh. Booth 208.

Recuperator on rod heating furnace; typical Duraloy-Sklovsky units operating with gas; model of Kathner normalizing furnace and Conklin sheet piler; section of typical sheath-type shaft; Y-valves; miscellaneous pipe fittings; cast impeller; hearth plate; rolling mill guides. Represented by:

EDWARD E. FOSS
Chairman
Golden Gate Chapter

CARL G. JOHNSON
Chairman
Worcester Chapter

C. P. Mills, chief engineer; E. S. Lawrence, metallurgist; and H. Hobbs, district representative.

Duriron Co., Inc., Dayton, Ohio. Booth 359.
New No. 80 Duriron centrifugal pump operating to show self-priming feature; new Duriron "Y" valve, plunger release valve, Duriron-Nordstrom valve, standard valve, Duriron pipe and fittings, Duriron fan, Duriron circulating steam jet, tank outlets, etc.; Durimet welded tank for pickling and Durimet material in the form of sheet and bars. Represented by: E. B. Thacker, W. B. Earnshaw, M. W. Smith, R. Rourke, E. D. Brauns.

E

Eastman Kodak Co., Rochester, N. Y. Booth 5.
X-ray negatives and photographs of castings showing internal flaws detected by the use of X-rays in the examination of these materials. Represented by: E. E. Smith.

Eclipse Fuel Engineering Co., Rockford, Ill. Gas section.
No. 245 oven furnace, hearth 24 x 48 in. complete single valve control and automatic temperature control, gas operated; injectors and burners of various kinds for gas; gas forge; high pressure gas; gas high-speed steel furnace; blast boiler; automatic shop room furnace; several gas-fired automatic boilers; and pressed steel pot display. Represented by: O. M. Olsen, sales manager; Kurt A. Scharban, works manager; D. A. Campbell, O. N. Sellers, E. A. Stoner.

Birger Egeberg, Meriden, Conn. Booth 410.
Volumetric carbon determination apparatus—determinations to be made in 3½ min.; optical pyrometer, vest-pocket size; and quick acting laboratory balance. Represented by: Birger Egeberg, manager.

Electric Steel Founders' Research Group, Chicago. Booths 89, 91, 93.
Representative small and medium-sized steel castings of carbon or common steels, and alloy or special steels, made in electric furnaces; physical test specimens, physical test report data; and photographs showing group plant equipment and operations. Represented by: R. A. Bull, director; C. N. Ring, assistant director; and representatives of group companies.

Electro Alloys Co., Elyria, Ohio. Booths 348 and 385.
Thermalloy castings of various types such as used in electric furnace construction and heat treating department equipment. Represented by: W. J. Hansen, H. P. Miller, A. M. Miller, Jr., J. W. Henry; J. B. Thomas, treasurer; A. L. Garford, president; W. C. Whyte, vice-president.

Electro Refractories Corporation, Buffalo. Booth 15.
Silicon carbide brick, in various shapes; high temperature cement; and Mag-NO-Spall brick (new electrically fused non-spalling magnesite brick); Tercod crucibles; Buffalo patch cement. Represented by: L. U. Milward, president; and C. A. Asher, vice-president; G. S. Diamond, works manager; C. L. Miller, C. F. Leitten, C. B. Davis, Jr., T. W. Campbell, D. B. Milward.

Elkon, Inc., Division of P. R. Mallory Co., Inc., Indianapolis. Booths 259 and 260.
Welded Ford A chassis on which are 1339 welds, 95 per cent of which are made with Elkonite dies and electrodes; Elkonite tip for the Brewster etchograph machine in demonstration. Represented by: A. O. Brauen, general sales manager; E. W. Brewer, L. F. Crease, C. R. Frede, J. F. Jenks, E. O. Oberdick, G. V. Rocky, G. N. Sieger, J. A. Toleik, R. R. Tomkins, J. A. Weiger.

Ellwood Ivins' Steel Tube Works, Philadelphia. Booth 410.
Seamless steel tubing; seamless aluminum tubing; seamless duralumin tubing; and seamless alloy tubing. Represented by: Horace S. Kircher, vice-president; Stanley Jeffries, Henry W. Avery.

Endicott Forging & Mfg. Co., Inc., Endicott, N. Y. Booth 90.
Steel drop forgings used in airplane, automobile and machinery fabrication. Represented by: S. J. Marshall, president; T. B. Kelday, superintendent; George B. Reed, sales manager.

Enduro Nirosta Committee. Booth 11.
Applications of Krupp Nirosta steel in various fabricated forms. Represented by: Central Alloy Steel Corporation, Massillon, Ohio; Ludlum Steel Co., Watervliet, N. Y.; and Babcock & Wilcox Tube Co., New York City.

Evans-Wallower Zinc Co., New York. Booth 397.

F

Falls Electric Furnace Corporation, Buffalo. Booth 341.
General heat treating furnaces of box type for temperatures up to 2000 deg. Fahr., one for operation from tool room bench and one hearth type of larger size cold for inspection; sample sections of Falls full-formed radiating sheet units. Represented by: H. J. McCauley, president; J. R. Eves, vice-president; and T. J. Llewellyn, salesman.

Federal Machine & Welder Co., Warren, Ohio. Booths 226 and 228.
One standard No. 1 portable butt welder which can be used in standard 110-volt circuit for welding up to 1/16 gage wire; one semi-automatic type 2-A butt welder capable of welding up to ⅜-in. round or equivalent cross section; one automatic type No. 60 butt welder capable of welding up to 1¼-in. round or equivalent cross section; one automatic Junior spot welder, a standard production machine on light gage material making from 60 to 120 spots per min.; 1-612-B heavy duty full automatic spot or projection welder. Represented by: H. L. McCreery, J. R. Kilpatrick, sales manager.

R. Y. Ferner Co., (United States and Canadian representatives of Societe Genevoise d'Instruments de Physique, of Geneva, Switzerland), Washington, D. C. Booth 374.
Swiss jig borer No. 4; Micro-indicator tubes and stands for high-precision measurements in inspection work; universal measuring machine; measuring microscopies of high precision. Represented by: R. Y. Ferner, proprietor; Fernand Turrettini, director general of Societe Genevoise; Walter S. Ryan, John Cetrule, Lambert Neff and Charles T. Ameel.

Ferry Cap & Set Screw Co., Cleveland. Booth 211.
Hardened and ground spring bolts; alloy steel parts used in automobile engines; special automatic screw machine parts; standard cap and set screws; and Ferry patent acorn nuts. Represented by: H. D. North, vice-president; H. B. Pulsifer, E. W. Ferry, E. G. Greene, H. A. Keith, William Murphy.

A. Finkl & Sons Co., Chicago. Booth 77.
Photographs of plant equipment and products. Represented by: E. H. Graham, T. P. Wallace, J. M. Curley, W. H. Rieger, J. C. Vance, C. E. Finkl, general manager; Fred Finkl, secretary; Frank Finkl, general superintendent; William Finkl and M. R. Chase.

Firth-Sterling Steel Co., McKeesport, Pa. Booths 69 and 71.
Special lathe designed for operating at exceptionally high speeds on which cutting demonstrations with Dimondite, the new tungsten carbide cutting material, are being carried on. Represented by: L. Gerald Firth, general manager; D. G. Clark, director of sales; Robert S. Stevick, works manager; G. J. Comstock, O. K. Parmiter, A. S. Martin, C. G. Thoma, A. E. Barker, O. T. Smith, H. I. Moore, E. T. Jackman, G. A. Jacobs, W. C Royce, W. J. MacFarland, J. V. Little, R. F. Kimber, F. N. Mead, I. Olsen, Harry Jarvis, Fred Jarvis, G. R. Bunting, J. Johnson and W. A. Ruppel.

Flannery Mfg. Co., Pittsburgh. Booth 366.
Various sizes of Niclad pots for use in the heat treating, annealing and cyaniding of steels. Represented by: J. Rogers Flannery, president; E. G. Flannery, H. D. Tietz, G. R. Greenslade, and John J. Kenney.

J. B. Ford Co., Wyandotte, Mich. Booth 76.
Wyandotte metal cleaners for cleaning before all finishing

operations; metal cleaners for cleaning before handling, assembling and inspection, and for removing japan, lacquer, paint, etc.; metals cleaned with Wyandotte metal cleaners will also be exhibited. Represented by: B. N. Goodell, W. M. Cole, George J. Lawrence, S. H. Renton, C. S. Tomkins, L. C. Warden, and C. R. Beaubien.

Fort Pitt Steel Castings Co., McKeesport, Pa. Booths 89 and 91.
Electric steel castings.

Fusion Welding Corporation, Chicago. Booths 315 and 317.
Line of equipment and supplies for fusion welding and cutting. Demonstrations will be conducted continuously, showing the work which can be done with the various special wires in the extensive Weldite line of welding rods. Various types of Fuzon arc welders will be shown in operation. Many unusual welding operations will be presented, such as the production of abrasion resistant deposits, corrosion resisting deposits, high speed work and high strength. The Carbo-Flux process of welding will be demonstrated. Represented by: J. B. Green, president; L. F. Collins, sales manager; E. J. Shuler, R. W. Holt, J. W. Wolcott, F. O. Weber, Jack McLean and R. F. Beazell.

G

Garlock Packing Co., Palmyra, N. Y. Booth 339.
Complete line of mechanical packings. Represented by: R. W. Perkins, B. B. Franklin and C. E. Hermansader.

Gas Products Co., Cleveland. Booth 239.
Oxygen and acetylene gas supplies and welding supplies. Represented by: S. M. Wells, manager.

Gathmann Engineering Co., Baltimore. Booth 1.
Ingot mold designs for improving surface of ingots; etched ingot sections; motion pictures illustrating ingot solidification. Represented by Emil Gathmann, president; G. A. Dornin and Mark Gathmann.

Gehnrich Oven Co., Inc., Long Island City, N. Y. Gas Section.
Automatic conveyor oven for japanning and enameling. This unit has a two-strand return pass conveyor provided with dip tank and drain board and heated by Gehnrich indirect gas system. Represented by C. L. Gehnrich, president; A. V. Maday, vice-president; W. Gehnrich, vice-president; H. P. Rasmussen and Herman Gehnrich.

General Alloys Co., Boston. Booths 32 and 53.
Full line of nickel-chromium heat treating containers and furnace parts made from Q-Alloys; carburizing boxes; cast, all sheet, combination cast bottom sheet body, combination corrugated sheet sides and cast corners (Patented); carburizing tubes; lead, salt and cyanide pots; supporting rings; cyaniding baskets; grid trays; full line of Link-Belt Q-Alloy chain for operation at high temperatures; also Q-Alloy point bars for vitreous enameling. Represented by: H. H. Harris, president; W. K. Leach, general manager; G. C. McCormick, chief engineer; W. R. Blair, F. J. Blaney, J. J. Baum, J. J. Donovan, W. A. Toohill, A. L. Grinell, J. H. Abbott, R. M. Kirk, Ralph Hare, H. G. Chase, E. R. Dougherty, C. E. Malley, J. C. Van Arman and R. N. Graves.

General Electric Co., Schenectady, N. Y. Booths 256, 257, 258, and 319, 321, 323.

Gibb Welding Machines Co., Bay City, Mich. Booth 237.
Spot welders; welding presses and Gibseamers (electric seam welders). Announcement and display of several new principles never before applied to electric spot and seam welding. Represented by: W. H. Gibb, president; C. E. Shearer and W. O. Little.

Globar Corporation, Niagara Falls, N. Y.
Ten kw. high temperature electric heating elements in actual operation in a special furnace constructed for the purpose. Represented by: A. H. Heyroth, general manager; K. E. Rogers, sales manager; B. A. Bovee, chief engineer; W. S. Evans and N. H. Berry.

H

Halcomb Steel Co., Syracuse, N. Y. Booths 59 and 61.
Aircraft parts; tool alloy; non-corrosive and special steels and alloys. Represented by H. A. Pardee, H. J. Stagg, J. T. Leyden, S. C. Spalding, J. F. Kirwan, Arthur Schroeder, Howard Hinkley, T. F. Wood, Harold Barlow, Allan Fraser, Leslie Hawkridge and Lee Evans.

Harrington Co., Philadelphia. Booth 433.
Harrington hoists and trolleys; Peerless spur geared hoists; Harrington screw hoists; Harrington differential hoists; Harrington electric hoists. Represented by: R. E. Bishop, secretary and sales manager; I. E. Bauer and J. A. Slaughter.

Harris Calorific Co., Cleveland. Booth 234.
Multi-stage welding regulators; approved welding torches of various designs and models; gas welding and cutting equipment; high temperature gas apparatus of various kinds; complete line of general accessories for welding and cutting metals. Represented by: J. M. Mathews, secretary and general sales manager; S. A. Oviatt, W. J. Krull and Otto Fathauer.

C. I. Hayes, Inc., Providence, R. I. Booth 390-A.
Electric Globar furnace for heat treating high-speed steel tools and equipped with attachment for furnace atmosphere control. Represented by: C. I. Hayes, chief engineer; J. E. Hines, sales manager; and C. G. Paulson.

Haynes Stellite Co., Kokomo, Ind. Booth 230.
Haynes Stellite cutting tools; demonstrations of Stelliting with Haynes Stellite welding rod; and Haystellite cutting tools. Represented by: F. P. Gormely, vice-president and general manager; F. T. McCurdy, assistant superintendent; W. A. Moore and E. E. Gordon.

Heppenstall Forge & Knife Co., Pittsburgh. Booth 82.
Complete working model of Gellert lifting tongs especially designed for the lifting of die blocks without the assistance of a man guiding the operation; shear knives; section of split ingot showing hard quality in EIS steel; Hardtem die block. Represented by: C. W. Heppenstall, president; B. B. Weinberg, vice-president; J. A. Succop; R. B. Heppenstall, vice-president; George I. Allen; F. C. Moyer, vice-president Heppenstall Steel Co.; George O. Desautels; Carl J. Sauer, manager Heppenstall Forge Co., Bridgeport, Conn.; A. J. Porter, Jr., sales manager Heppenstall Forge Co.; A. L. Wurster and L. A. Daines.

ADAM M. STEEVER
Chairman
Chicago Chapter

R. H. PATCH
Chairman
Philadelphia Chapter

E. F. Houghton & Co., Philadelphia. Booths 354, 355, 371 and 373.

I

Illinois Steel Co., Chicago. Booths 58 and 79.
Motion picture showing the basic processes of making steel and illustrating in detail the operations of the electric furnace and alloy steel departments at the South Chicago plant. Represented by: W. I. Howland, Jr., assistant general manager of sales; R. Korsan, J. H. McKown, A. R. Williard, R. G. Glass, F. B. Mulvaney, E. Davidson, Fred W. Bendell, C. R. Moffat, James R. Mills, manager of sales, Cleveland; G. A. Price, G. Landrus, J. Hornbrook, W. H. Brainard, C. E. McIntyre, R. C. O'Neill, H. W. Parker, W. S. Saylor, C. T. Siebert.

Index Machinery Corporation, Cincinnati. Booth 360.
Huster filing and sawing machine, a tool especially designed

THE IRON AGE will occupy booth 372 at the Steel Treaters' Exposition. Members of the editorial, advertising, sales promotion and subscription departments will be present. Copies of THE IRON AGE and reprints will be available.

for the making of dies and odd shaped parts. Represented by: Joseph F. Geers, president and general manager; James J. Dillon, Max A. Knorpp.

International Nickel Co., Inc., New York. Booth 94.
Display material to illustrate the use of nickel and nickel alloys in industrial applications. Represented by: T. H. Wickenden, Charles McKnight, H. J. French, N. B. Pilling, F. B. Coyle, J. S. Vanick, C. A. Crawford, R. J. McKay, T. J. Wood, O. B. J. Fraser, J. W. Sands, A. L. Roberts, D. E. Ackerman, R. L. Suhl, R. A. Wheeler, L. Muller-Thym, E. J. Bothwell, H. C. Armstrong.

Interstate Iron & Steel Co., Chicago. Booths 52 and 73.

Irwin Lumber Co., Erie, Pa. Booth 338.

J

William Jessop & Sons, Inc., New York. Booth 23.
Reception, description and distribution of matter pertaining to product of company. Represented by: F. C. A. H. Lantsberry, president; Robert Ross, secretary; C. L. Bailey, Hans Johnson, G. J. MacQuarrie, H. S. Norman, L. H. Cummings.

A. W. GROSVENOR
Chairman
St. Louis Chapter

WALTER L. TRUMBAUER
Chairman
Lehigh Valley Chapter

Jessop Steel Co., Washington, Pa. Booth 8.
Tool steel bars; fractured pieces and microscope for examination; finished dies and parts made for our tool steels; display boards of cold rolled strip steel, razor blade steel; stainless steel articles and parts; finished cutlery display boards both stainless and carbon steel of Jessop manufacture; evolution of finished saws, displaying various steps from the raw material to the finished tool. Represented by: S. A. Grayson, president; R. E. Emery, vice-president; F. T. Youngman, secretary-treasurer; R. J. Murray, V. M. Wellman, D. J. Hanna, A. G. Lambert, W. A. Salt, C. M. Cunningham, W. J. Frederick, and J. C. Dawson.

Johns-Manville Corporation, New York. Booth 395.
With the merger of the Johns-Manville Corporation and Celite Products Co., insulation display covers the complete field in high temperature and low temperature insulation. Display includes building materials, such as asbestos shingles, Transite, industrial flooring, etc., and a complete line of packings. Represented by: Eugene Dowling, G. E. Grimshaw, J. W. Blenmker, R. S. Hemmingson.

Jones & Laughlin Steel Corporation, Pittsburgh. Booths 55 and 57.
Hot-rolled and cold-finished steels, including Jalcase steel parts, cold-finished steel sections, light weight channels, junior beams, steel piling, tubular products and other items of interest. Represented by: W. B. Todd, manager of sales, cold-finished sales department; J. D. Allen, C. C. Henning, J. H. Flaherty, W. R. K. Scott, H. W. Graham, E. A. France, J. G. Hutchinson, A. A. Wagner, assistant manager of sales, hot-rolled sales department. From Higgins-Bothwell Co., Detroit: W. J. Bothwell, J. T. Ferris, J. W. Robinson, R. W. Light, W. E. Danz.

K

K-G Welding & Cutting Co., Inc., New York. Booth 262.
Generators, oil burning equipment; all types of welding, gas welding and cutting torches; new style "K" oxygen and acetylene regulators. Represented by: William D. Flannery, E. Brass, H. H. Kress, William Munn, P. Noren, John Evans, A. W. Carr.

Keller Mechanical Engineering Corporation, Brooklyn. Booths 407 and 429.
A type BL Keller full automatic tool room machine, equipped with two-template rigging and attachment for locating and jig boring; a type R-6 Keller cutter and radium grinder; a KELLocatER complete unit with overarm and improved spindle (power feed); the line of Kellerflex flexible shaft machines, including the new 1 HP outfit. Represented by: S. A. Keller, treasurer; A. S. Keller, advertising manager; Henry Schreiber, Charles Bitter, P. C. Renno, W. L. MacRae, E. D. Ashley, Arthur Jenner, Paul Loewenberg.

J. W. Kelley Co., Cleveland. Booth 68.
Beacon brand products including carburizing compounds; lead pot carbon; annealing carbon; quenching oil; tempering oil; industrial oil; heat treating salts; and tempering salts; Greene quenching and washing machine. Represented by: J. W. Kelley, president; J. E. Burns, vice-president; H. B. Northrup, secretary; P. E. Holder, H. M. Webb, P. J. Myall, J. H. Hopp, C. F. Boyd.

Kelley-Koett Mfg. Co., Covington, Ky. Booth 314.
X-ray apparatus for fluoroscopic and radiographic study of metals, also assortment of films showing results of radiographic tests. Represented by: W. S. Werner, secretary and chief engineer; Dr. Hahn and H. C. Steadman.

C. M. Kemp Mfg. Co., Baltimore. Gas Section.
Improved Kemp system for the industrial utilization of natural or artificial gas, burner equipment adaptable to all industrial process heating supplied by this Kemp system is displayed; Nash motor operated similar to the "block test" at the Racine plant is also shown. Represented by W. M. Ponder, R. S. Van Note, W. S. Bassett, F. H. Andrews, William Hunt and E. B. Dunkak, sales manager.

Charles F. Kenworthy, Inc., Waterbury, Conn. Booth 327.
Pictures of various installations; and samples of annealed products. Represented by: C. F. Kenworthy, president; H. A. Kenworthy, general manager; R. E. Worthington, R. N. Griswold.

Keystone Lubricating Co., Philadelphia. Booth 3.
Keystone safety lubricating system including the new Keystone pneumalectric lubricating system, which provides for completely automatic operation. The pressure is maintained by a motor compressor set which delivers grease to a rotary distributor, from which lines lead to the various bearings of a machine unit. Represented by: G. W. Hall, Philip King, Vic. Berguson, R. McDaniel, M. C. Schwenk.

L

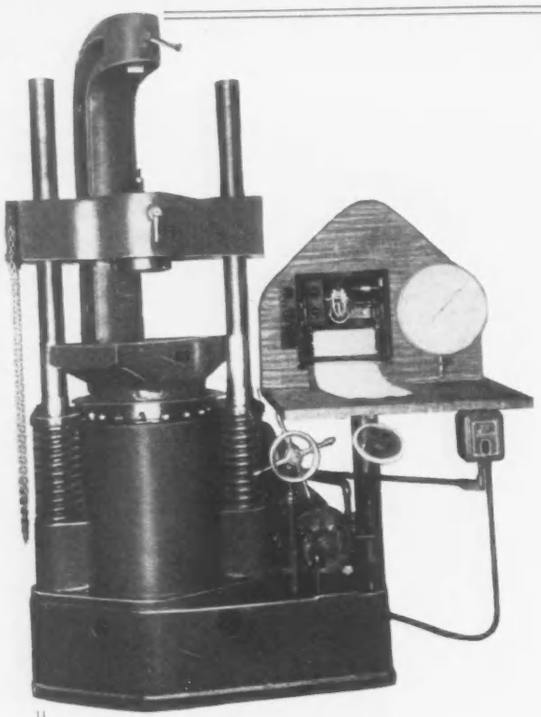
Lakeside Steel Improvement Co., Cleveland. Booth 6.
Photomicrographs and fractures of various grades of steel treated and untreated; heat treated parts, such as motor blocks, drive shafts, axle shafts, connecting rods, pistons, skid chain, bolts and nuts and various automotive parts, besides a collection of airplane parts which were heat treated at the plant of the Lakeside Steel Improvement Co., such as connecting rods, airplane struts, boomracks, ratchets, clevises and turn buckles. Represented by: C. W. Derhammer, president; R. T. Morrow, vice-president; R. L. Rolf, secretary and metallurgical engineer; John Hume, Jr., assistant metallurgical engineer.

Lava Crucible Co. of Pittsburgh, Pittsburgh. Booth 60.
Full line of the various types of super-refractories in standard brick, standard tile, special shapes, plastics, cement and graphite crucibles. Represented by: Furman South, Jr., president; H. E. White, D. E. MacLean, R. P. South, C. H. Knappenberger.

E. J. Lavino & Co., Philadelphia. Booths 349 and 350.
Many varieties and grades of chrome ores from all parts of the world, in the crude and ground form; "Lavino" chrome, magnesite and silica brick; Kromepatch, multi-bond refractory cement; Neutragrog, a chemically neutral aggregate for monolithic construction; plastic K-N chrome, a prepared chrome product ready for molding in place. Represented by: R. E. Griffith, A. DeMacedo, J. B. Luckie, R. C. Hanson, W. C. Holzworth, H. W. Pigott, P. S. Haserodt.

Lebanon Steel Foundry, Lebanon, Pa. Booths 89 and 91.
Electric steel castings.

Leeds & Northrup Co., Philadelphia. Booths 353 and 375.
Automatic temperature controllers; pyrometers; temperature recorders; temperature indicators; portable precision potentiometers; portable temperature indicators; thermocouples; miniature Hump furnace and Leeds and Northrup potentiometer; miniature Homo furnace and Leeds and Northrup potentiometer pyrometer. Represented by: H. Brewer, A. F.

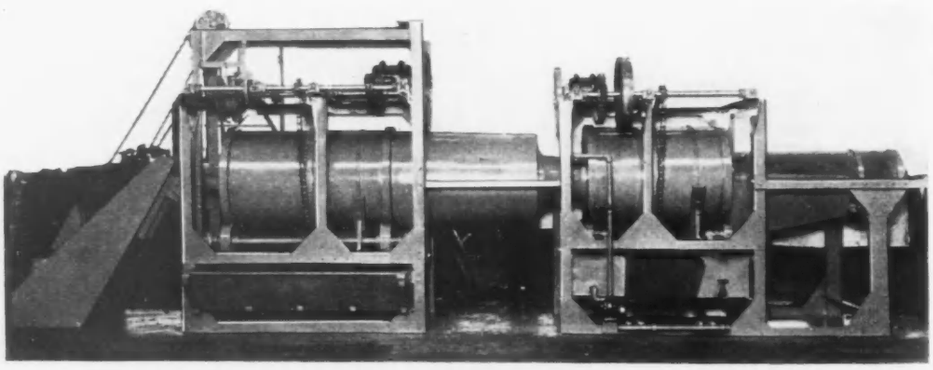


Testing-Machine Recorder

A NEW testing-machine recorder has been developed by the Southwark Foundry & Machine Co., Philadelphia, in conjunction with the Leeds & Northrup Co., also of Philadelphia. This equipment, as illustrated, draws on an enlarged scale an accurate stress-strain diagram of materials tests, showing the critical points in great detail. The range of the recorder may be varied by changing the voltage of the electrical circuits. Both stress and strain are picked up by electric telemeters and transmitted through wires to the remote potentiometer recorder which is, in reality, a double recorder. Its initial appearance will be at the National Metal Exposition.

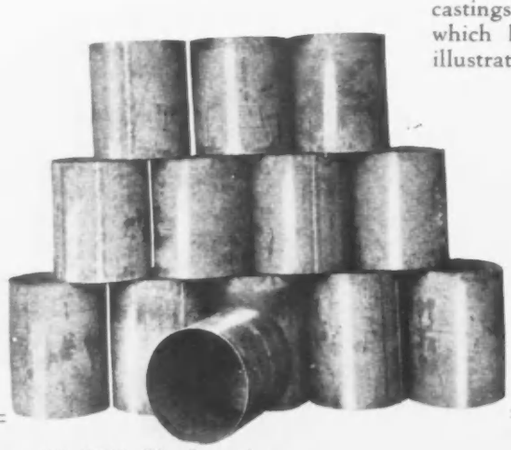
Ideal Acid Flotation Process Tumbler

FOR removing scale from forgings, stampings and similar parts, N. Ransohoff, Inc., Cincinnati, will exhibit at its booth at the National Metal Exposition an acid flotation tumbling equipment.

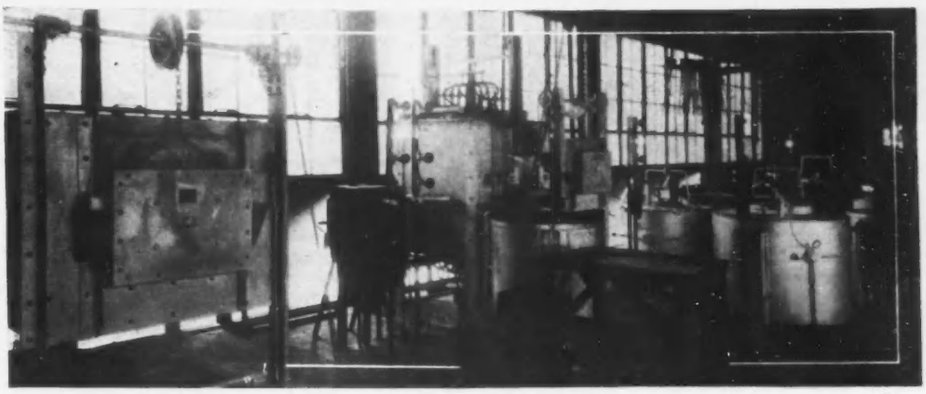


Heat-Resisting Alloys

IN its booth at the National Metal Exposition, the Chicago Steel Foundry Co. of Chicago will exhibit its heat-resisting alloy known as Pyrasteel in the shape of castings designed for special purposes and old castings which have rendered exceptionally long service. The illustrations show some of the shapes in which the alloy containers for heat treating are made.

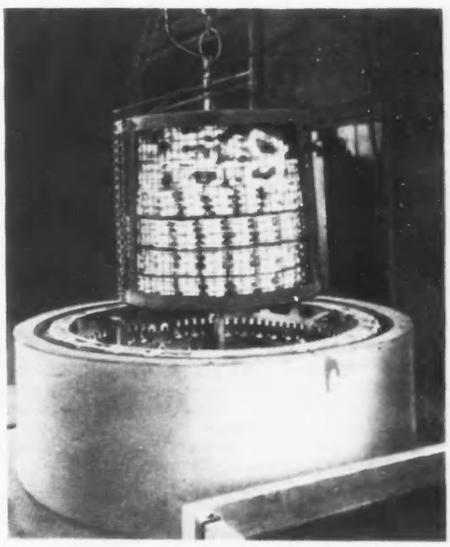


Electric Heat-Treating Department

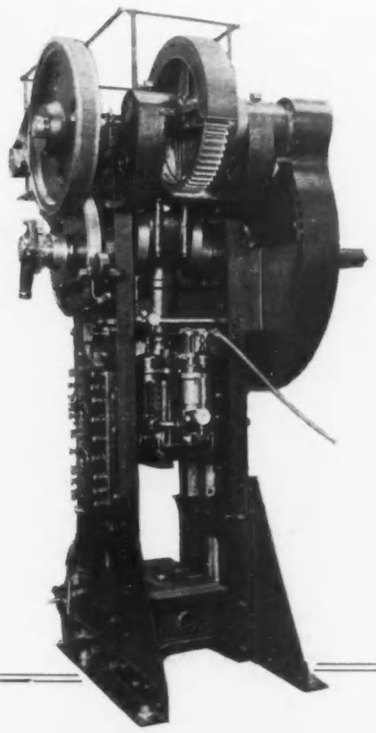


FOR the manufacture of precision twist drills, reamers, cutters, etc., Whitman & Barnes, Inc., Detroit, has a heat-treating department here illustrated. Temperature and time are controlled automatically from a central station. The various tools are tested for hardness, and actual performance tests are run. A research department is also maintained.

Electric Furnace for Heat Treating Aluminum Alloys



A NEW furnace has been recently announced by the General Electric Co., Schenectady, N. Y., for heat treating aluminum alloys. It is a pit type, cylindrical unit. In a typical application of this furnace, shown in the illustration, a run of castings, weighing approximately 500 lb., plus a basket weight of 700 lb., both at room temperature, was placed in a furnace at a temperature of 900 deg. Fahr. In 1½ hr. the center of the charge was at the heat-treating temperature. The working dimensions are a diameter of 4 ft. and a depth of 6 ft.



A New Hydraulic Eccentric Press

AN eccentric press with a hydraulic pressure regulating device has been installed in a drop forging plant in the Chicago territory by Henry Pels & Co., 90 West Street, New York. The regulating device is designed to release the pressure automatically as soon as the permissible maximum is reached, which, on this particular machine, is 330 tons. The compression fluid will escape into the overflow tanks, the plunger will continue its movement without forcing the ram any further and, upon its return stroke, will draw the compression fluid back into the cylinder by suction, so that the machine can continue to work without interruption even after the overload protection device has operated. The press has been used for straightening automobile crank shafts.

Moranty, E. G. Estabrook, P. H. Taylor, G. W. Tall, A. E. Tarr, J. E. Korp, and T. C. Smith.

E. Leitz, Inc., New York. Booths 74 and 95.
Leitz micro-metallograph; Leitz metallurscope; Guthrie-Leitz grinding and polishing machine; line of Leitz microscopes of smaller size and numerous accessories. Represented by: R. Tvestmann, O. Soetbeer, S. Borell.

Lincoln Electric Co., Cleveland. Booth 224.
The new improved Lincoln "Stable-Arc" welder and the latest type of welding accessories and supplies. During exhibition, range boilers automatically arc-welded by the Electronic Tornado process of carbon arc welding. Represented by: A. F. Davis, vice-president; Maurice Taylor, T. P. Tarbell, B. F. Kessler, O. P. Hanchette, R. B. Tuhey, A. T. Smith.

Linde Air Products Co., New York. Booths 225, 227 and 229.
Complete line oxyacetylene welding and cutting apparatus and supplies; complete line welding generators; Carbic flood lights. Represented by: H. F. Buckley, T. C. Fetherston, H. H. Griffith, H. H. Dya, De W. Endicott.

Ludlum Steel Co., Watervliet, N. Y. Booths 22 and 51.
Enduro KA2 steel; nitralloy steel; tool steels; carbon and alloy; high-speed, die, chisel, non-shrinking oil-hardening, carburizing, ball bearing, permanent magnet, and heat-resisting steels; forgings, drill rods; shown in finished forms; rustless iron and steel; shown in finished forms; Straus metal, tungsten carbide cutting material, manufactured under license agreement with Carboloy Co. and under direct supervision and with benefit of original Krupp experience. Represented by: H. G. Batcheller, vice-president; F. B. Lounsberry, vice-president; J. E. Polhemus, A. F. Dohn, C. B. Templeton, H. A. DeFries, J. T. Norton, Ralph DeVries, A. K. Martin, C. W. Lindemuth, W. H. Vrooman, C. B. Boyne, K. G. Reynolds, W. Westover, W. H. White, T. C. Sherman, H. I. Askew, J. C. Gearhardt, H. Hardwicke, P. E. Floyd, G. F. Wilson, G. Peterson, G. D. Sleeth, W. P. Ehrenberg, P. R. Thurston, W. Kinsey, G. D. Howk, J. E. Jones, E. E. Sanborn.

M

Paul Maehler Co., Chicago. Booth 206.

Mahr Mfg. Co., Minneapolis, Minn. Booth 356.
Enlarged photographs, photostats and prints illustrating outstanding continuous furnaces, car-type furnaces and batch-type furnaces of standard and special design, installed in leading industrial plants of the country. Represented by: W. G. Barstow, sales manager; O. E. Ertl, chief engineer; D. H. Ruhnke, A. J. Nordenson, Minneapolis; B. G. Harmon, R. G. White, A. E. Stenzel, R. A. Ledebur, A. F. Tenney.

Manhattan Rubber Mfg. Co., Abrasive Wheel Department, Passaic, N. J. Booth 361.
Typical examples of parts ground with Manhattan rubber-bonded wheels. These include products of many large and well known manufacturers. They range from the rougher classes of work, such as manganese steel track castings, high speed billets, forgings, etc., to the finer operations such as cutlery, thin circular knives and high grade ball bearings. Represented by: W. H. Steinberg, C. M. Lawton, C. A. Fox, C. E. Forney, R. G. Brinkerhoff, Howard Pyle.

Marburg Brothers, Inc., New York. Booth 203.
Thiel precision die filing and sawing machines. Represented by: Theodore H. Marburg, president; O. P. Brett, Richard Krause, Herbert Zimmerman.

McCann-Harrison Corporation, Cleveland. Booths 273 and 289.
One model continuous conveyor beam furnace. Represented by: H. P. McCann, president; Robert L. Corbett, sales manager; Edward Busch and Charles L. Stuart.

Metal & Thermit Corporation, New York. Booth 236.
Heavy thermit welding samples and metal samples. Represented by: Henry D. Kelley.

Michigan Steel Casting Co., Detroit. Booths 37, 89 and 91.
Misco alloys in the form of castings, rolled bars, wire, and sheets—to show the possibilities of fabrication using the afore-mentioned, several fabricated pieces are shown, such as Misco combination cast base sheet wall carburizing boxes, dipping baskets, dipping racks, Hump furnace racks, etc. Represented by: F. J. Stanley, general manager; E. D. Flintermann, sales manager; J. D. Corfield, A. A. Gould.

Michiana Products Corporation—Chrobaltic Tool Co. Division, Michigan City, Ind. Booth 204.
Heat resisting and acid resisting castings, including the Fire Armor and Zorite alloy. Represented by: W. B. Sullivan, vice-president and general manager; L. H. Whiteside, C. M. Conner, J. F. Sweeney, A. A. Cash, O. G. Voss, T. A. Meyer, Charles Peterson, H. Klouman, E. Whiteside.

Midvale Co., Philadelphia. Booths 54 and 75.
Miscellaneous forgings, tool steel products and alloy steel products. Represented by: A. C. Dinkey, president; Stuart Hazlewood, vice-president in charge of sales; H. L. Frevert, vice-president in charge of operations; Howard Myers, engineer of tests; J. R. Adams, superintendent special products; Francis B. Foley, research engineer; Henry Ziesing, assistant general sales manager; H. E. Rowe, bar steel sales manager; Walter B. Smyth, Fred W. Sager, Harvey Garrett, Robert M. Bird, Thomas Besom, Herbert Cox, J. H. Glass, L. C. Berkey, Harry Teel.

J. G. GAGNON
Chairman
Detroit Chapter

JAMES TAYLOR
Chairman
Schenectady Chapter

A. Milne & Co., New York. Booth 284.
Milne tool and die steels; hollow drill steel; solid drill steel; auger drill steel; special sections; MR Swedish Lancashire iron; Swedelec cold drawn electrical iron; Nohab anvils; forged tools; Wardlow's file steel; Wardlow's cutlery sheets; Prince ball bearing steel; Reynolds aircraft tubing. Represented by: V. A. Greene, general sales manager; Henry Sears Hoyt and J. King Hoyt, Jr., members of the firm; A. G. Reid, B. Brower, Miss K. E. McDonald, H. R. Adams.

Milwaukee Die Casting Co., Milwaukee. Booth 47.
Many sizes and shapes of tin, lead, zinc, and aluminum-base alloy die castings; also a die showing how die castings are made; working model demonstrating die cast gears are also in operation. Represented by: C. H. Frantz, sales engineer, and H. F. Schroeder, vice-president.

Morse Twist Drill & Machine Co., New Bedford, Mass. Booth 56.
High speed and carbon twist drills; reamers; milling cutters; taps and dies. Represented by: W. T. Read, vice-president and treasurer; F. O. Lincoln, vice-president, in charge of sales; R. F. Chase.

N

National Electric Light Association, New York. Booths 448, 449, 450, 451 and 452.
Photographs illustrating applications of electric furnaces to steel heat treating; this exhibit is sponsored by the industrial heating committee, and is of an educational nature. Represented by: J. L. Faden, chairman, industrial heating committee; Robert M. Keeney, vice-chairman; R. T. Kaighin, secretary; James H. Faulkner, Charles E. Russell, O. Wilhelmy, H. J. Hall, C. P. Yoder.

New Jersey Zinc Co., New York. Booth 414.
Endless chain of approximately 40 die castings of small and intricate design moving along front wall of booth. On center back wall is theater having about eight particularly interesting die castings of larger size. Also rolled zinc chromium plated and nickel plated, which is being used in many industries. Represented by: C. R. Maxon, S. E Maxon, R. M. Curts, R. Davidson, W. J. Keuhn, W. P. Hardenbergh, Jr.

Northwestern Mfg. Co., Milwaukee. Booth 234.
One 300-ampere arc welder; and one non-operating gasoline engine driven arc welder; also welding parts. Represented by: E. L. Hansen, F. A. Wilch, A. H. Friese.

Norton Co., Worcester, Mass. Booths 288 and 290.
High-speed grinding equipment; American electric furnace; Norton abrasive products, and Norton heavy refractories. Represented by: Robert Kirkpatrick, sales manager, refrac-

H. L. HOPKINS
Chairman
Case Group

H. F. DAVIS
Chairman
Ontario Chapter

tories division; H. A. Blackburn, K. H. Bird, A. R. Sandine, R. H. Cannon, A. T. Douglas, H. R. Swanberg.

Nugent Steel Castings Co., Chicago. Booths 89 and 91.
Electric steel castings.

O

Ohio Steel Foundry Co., Springfield, Ohio. Booth 278.
Fahrite, a heat resisting alloy for temperature up to 2200 deg. Fahr. Produced in a complete range of nickel-chromium and iron-chromium base alloys. Represented by: W. J. Gilmore, vice-president; W. J. Hayes, Jesse F. Monfils.

Tinius Olsen Testing Machine Co., Philadelphia. Booth 48.
A 100,000-lb. capacity Olsen 3-screw rotating gear nut-type automatic and autographic universal testing machine with automotive quick change eight-speed reverse gear box drive, complete with attachments for various forms of tests and latest extensometer equipment; Olsen combined impact tension and cantilever type (Izod type) of impact tester; Haight alternate stress testing machine for determining fatigue limit in tension and compression; Olsen direct motor-driven production type Brinell hardness tester; Herbert pendulum hardness tester with operating stand; Herbert direct motor driven production type "Cloudburst" hardness tester for hardness testing and also arranged for superhardening steel parts; Olsen direct motor driven production type ductility testing machine for determining the drawing quality of sheet metal; Olsen proving or verifying rings of various capacities; various types of strain gages and measuring instruments used in connection with testing equipment; Olsen-Lundgren dynamic balancing machine operating on centrifugal high tension spark principle; Olsen-Lundgren automatic weighting static balancing machine for statically balancing rotating parts. Represented by: T. Y. Olsen; R. B. Lewis; Jacob Lundgren; and Bruce L. Lewis.

P

Page Steel & Wire Co., New York. Booth 311.
Testing machines showing De Forest magnetic method of testing Page Armco welding wire for gas and electric welding. This machine is a development of the research department of the company and is a rapid non-destructive test method. Represented by: W. T. Kyle, J. J. Flaherty, C. A. McCune and W. L. Walsh.

Park Chemical Co., Detroit. Booth 15.
Case hardening compounds; cyaniding compounds; drawing salts; re-heating salts; lead pot covering; carbon preventer; lacquer rubbing compounds; masking compounds; and quenching and drawing oils. Represented by: Joseph N. Bourg, vice-president and general manager; J. C. Thompson, F. W. Faery.

Henry Pels & Co., Inc., New York. Booths 203, 205, and 207.
Type FV-55 big billet shear—capacity 5¼-in. cold steel bars; Type STAQ-16 gate shear—capacity 80-in. x ⅝-in. steel plate; Type Pg. 35 closed throat press—capacity 220 tons—equipped with dies for manufacture of spring leaves; Type BLUEFGA-22sp. combination punch, plate shear, angle, bar and tee cutter, with extra high punch throat for large H-columns and Bethlehem beams; Type MAE-16 combination punch, plate shear, angle, bar and tee cutter with built-in notcher—for medium capacities; Type ME-10 combination punch, plate shear, angle, bar and tee cutter with built-in Coper—for lighter capacities; Type EFG-16 angle, bar and tee cutter—capacity 6 x 4-in. angles, etc. Represented by: C. L. Martin, vice-president; T. F. Kane, E. E. Tailfer, and J. A. Weigand.

Permutit Co., New York. Booth 370.
Water softening and filtering equipment for industrial plants; Ranarex instruments for recording gas density, ammonia gas, etc. Represented by: H. M. Danner and H. M. Olson.

Pittsburgh Instrument & Machine Co., Pittsburgh. Booth 96.
Testing machines, Brinell testers—precision, production, power-driven and hand-operated; impact testing machine; sheet metal tester; metallographic grinder; Brinell microscope; depth indicator; proving ring; and for the first time direct-reading Brinell instrument attached to Brinell machine showing the diameter of ball impressions on a ground glass plate while the test load is applied. Represented by: Charles Trueg and Walter Kammerer.

Pressed Steel Co., Wilkes-Barre, Pa. Booth 410-A.
Complete line of Lite-Wate Rezistal carburizing and annealing boxes; welded and seamless formed containers. Seamless formed stampings of various grades of chrome and chrome-nickel alloys. Represented by J. H. MacVeigh, vice-president and sales manager; F. A. Schmidt, works manager.

Production Machine Co., Greenfield, Mass. Booth 306.
Type "A" centerless polishing and finishing machine (heavy duty); type "S" centerless polishing and finishing buffing machine; and type "R" combined disk-grinder and polishing machine. Represented by: W. S. Howe, president; A. H. Behnke, vice-president and sales manager; T. A. Welsh, superintendent.

Thomas Prosser & Son, New York. Booth 401.
Commercial tool grinder; Monarch lathe; Widia tungsten carbide lathe tools, planer tools, shaper tools, drills, reamers, milling cutters, boring and special tools. Widia tungsten carbide tools will be demonstrated cutting various materials at high speeds, speeding up production with corresponding reduction in costs. Represented by: R. D. Prosser, general manager; W. E. Guild, sales manager; E. R. S. Reeder, J. A. Deakin, J. Hugo Smith, H. B. Spaulding, H. E. Berry, L. N. Hall.

R

N. Ransohoff, Inc., Cincinnati. Booth 392.
Star return tumbling barrel; enlarged photographs of various jobs for descaling forgings, cleaning stampings, etc.; samples of work done by this equipment. Represented by: N. Ransohoff and D. M. Powers.

Reeves Pulley Co., Columbus, Ind. Booth 316.
Several different designs of the Reeves variable speed transmission, a compact, mechanical unit which is used in conjunction with any type of production machine or conveyor to provide the ability to secure infinite speed variation and adjustability. Represented by: Carl M. Reeves, vice-president, and C. L. Irwin.

George P. Reintjes Co., Kansas City, Mo. Booth 279.
Interlocking arch tile consisting of shapes that completely build any varying spans of roof and door arches over forging and heat treating furnaces. Represented by: George P. Reintjes.

Republic Flow Meters Co., Chicago. Booth 275.
New Republic control pyrometer; also complete exhibit of Republic flow meters, CO_2 meter and gas meters. Represented by: K. B. Roudebush, C. H. Tate, T. E. Bell, C. E. Pritchett, R. C. Ascher, E. Schneider.

Riehle Brothers Testing Machine Co., Philadelphia. Booth 100.
Vickers hardness tester; calibrating rings; Brinell machine; mirror extensometer reading to one hundred thousandth of an inch; and similar apparatus. Represented by: A. Fuller Riehle, vice-president and superintendent.

Stanley P. Rockwell Co., Hartford, Conn. Booth 404.
Rockwell dilatometer with inclosed panel attached to pit type electric furnace. The furnace is operated to demonstrate the simplicity of heat treatment by the Volcrit method. Portable quenching tank agitator which can be attached to practically any quenching tank as desired, and produces swirling action in the quenching medium or jet against the work being quenched. Represented by: Stanley P. Rockwell, president; and William A. Stumpf, sales manager.

John A. Roebling's Sons Co., Trenton, N. J. Booth 234.
Samples of welding wire. Represented by: R. R. Newell.

Roessler & Hasslacher Chemical Co., New York. Booths 19 and 21.
Complete line of chemicals used in the case hardening, heat

treatment, and heat coloring of steel; complete line of chemicals used in the electroplating of metals; demonstration of electroplating of copper, cadmium and zinc on steel; a demonstration of heat coloring of steel; demonstration of a new method for the approximate determination of cyanide in case hardening baths. Represented by: Walter M. Gager, Charles H. Proctor, Carl Dittmar and Carl Hamann.

Rotor Air Tool Co., Cleveland. Booth 343.
Portable pneumatic drills; grinders; sanders; and buffers. Represented by: H. P. Bailey, president; K. L. Pohlman, vice-president; W. G. Baily and C. B. Scott.

Ruemelin Mfg. Co., Milwaukee. Booth 326-A.
Sanitary sand blast cabinet complete; No. 5 exhaust-type fan; midget sand blast gun; operator's sand blast helmet; Junior sand blast generator. Represented by: H. A. Flitz and T. C. Tipper.

Rustless Iron Corporation of America, New York. Booth 93.
Articles made from rustless iron, such as automobile parts, bars, strip, sheets, wire, tubes, etc.; raw material—chrome ore. Represented by: Dr. M. H. Sommer and A. L. Grinell.

Ryan, Scully & Co., Philadelphia. Booth 348.
New type of automatic control valve that contains features of program control and multiple stage adjustment and is to be known as multiple stage control; new type of continuous belt, which weighs less than 4 lb. a sq. ft., is made of alloy links of patented character and is capable of carrying 90 lb. a sq. ft.; miscellaneous types burner equipment. Represented by: F. J. Ryan, president; Gordon A. Webb, A. H. Kruger and J. Kniveton.

Joseph T. Ryerson & Son, Inc., Chicago. Booth 368.
Samples of general steel products; cold-rolled steel products; tool and alloy steels; and rust and heat resisting alloys. Represented by: H. B. Ressler, general manager of sales; Fred Doran, G. Van Dyke, A. Y. Sawyer and Charles Kehr.

S

Safety Equipment Service, Cleveland. Booth 233.
Safety equipment and devices; Super-drednaut goggles for chippers, grinders, welders and all industrial uses; Dr. Wood respirators; "Safety Service" clothing made of asbestos, leather, fire resisting duck, water resisting duck, acid proof cloth, rubber and other materials; "Safety Service" safety shoes; sand blast and dust hoods; welding helmets; gas masks; safety and danger signs; first aid kits and supplies. Represented by: Buel W. Nutt, president; Harry F. Lea, Andrew Evers, F. C. Blake and E. C. Lyon.

Selas Co., Philadelphia. Booth—Gas Section.
Selas gas mixing machines operating various industrial gas appliances, such as brazing torches, self-heating solder irons, burner tips for japanning, wire ovens, etc.; needle flame burners for can manufacturing, wire fusing, etc. Selas-fired industrial gas furnace and various furnace burners and bunsens. Represented by: Fred Hess, manager; and E. A. Furkert.

George Scherr Co., Inc., New York. Booth 200.
Carl Zeiss precision measuring machines and instruments; Taylor rotary cutting-off machine; Schuchardt & Schutte thread milling machine demonstrated with thread holes. Represented by: George Scherr, president and manager; Fritz Konig, vice-president; George Kaner and George Van Daplank.

Sentry Co., Taunton, Mass. Booth 391.
Sentry size No. 2 model H S and size No. 1 model L furnaces with control, also high-speed steel hardening using the Sentry diamond block method. Represented by: F. B. Crocker and A. A. Haryer.

Shakeproof Lock Washer Co., Chicago. Booth 357.
Entire line of standard lock washers and locking terminals; large exhibit of the Shakeproof locking principle and the actual locking of the washers practically demonstrated. Represented by: Herbert M. Howison and Jack M. Gribbie, sales manager.

Shawinigan Products Corporation, New York. Booth 239.
Carbide and carbide packages. Represented by: W. P. Chur.

Shore Instrument & Mfg. Co., Jamaica, N. Y. Booth 17.
Regular line of hardness testing instruments consisting of C-2 scleroscope, bulb type; "D" scleroscope, dial type; Shore monotron; rubber testing instruments; optical pyrometers, Pyroscope, types A and B; Localcase and Localhard are shown with samples of their usage. Represented by: F. G. Kendall, sales manager; and J. M. Kendall.

Simonds Saw & Steel Co., Fitchburg, Mass. Booth 342.
Metal-cutting circular and band saws; files, hack saw blades; high-speed, carbon, magnet and special tool steels. Represented by: C. R. Pafenbach, steel sales manager; George T. Curtis and Harry P. Baumann.

Sivyer Steel Casting Co., Milwaukee. Booths 89 and 91.
Electric steel castings.

David H. Smith & Sons, Inc., Brooklyn. Booth 438.
Smith billet shears; Smith angle bending rolls; and Smith model 91 size 16 special. Represented by: William H. Kay, manager machinery sales; Dudley J. Smith, vice-president; Olaf Olsen, and Cleveland Tool & Supply Co., salesmen.

Snap-On Wrench Co., Chicago. Booth 280.

Southern Manganese Steel Co., St. Louis. Booth 18.
Fahralloy high temperature and corrosion resisting products. Represented by: F. A. Fahrenwald, A. W. Daniels, general sales manager; Russell J. Williams, assistant sales manager; and D. M. Powers.

Southwark Foundry & Machine Co., Philadelphia. Booth 31.
Southwark-Emery universal testing machine; 40,000-lb. hydraulic testing machine for field tests of welded-joint development in combination with Union Carbide & Carbon Research Laboratories; McCollum-Peters electric telemeter in operating exhibit showing the remote recording of stress, strain and pressure; Whittemore strain gage; Huggenberger tensometer. Represented by: F. G. Tatnall, manager, testing equipment division; H. A. Weaver and H. J. Ruch.

Spencer Turbine Co., Hartford, Conn. Booth 291.
Spencer turbo-compressors which are used for supplying air in connection with oil and gas burning industrial furnaces, foundry cupolas, etc. Represented by S. E. Phillips, president; F. A. Wright, F. E. Warnke and R. A. Brackett.

Square D Co., Detroit. Booth 332.

William K. Stamets, Cleveland. Booths 205, 205-A and 207.

Standard Alloy Co., Inc., Cleveland. Booth 33.
Standard alloy lead pots; cyanide pots; normalizing and pack heating furnace discs and spacers; insulated shaft assembly for normalizer; enameling burning racks; chain grate castings for heat resisting service; furnace trays and shoes; roller rails; skid rails and shoes; pump casings and impellers; furnace parts and miscellaneous heat and acid resisting castings covering in general the heat treating and chemical field. Represented by: Harvey M. Smith, sales manager; Frank F. Jackson, superintendent; Emerson M. Williams, secretary; Charles D. Cutting, H. A. Cutting, W. D. Mann, George S. McFarland and A. D. Darragh.

Standard Equipment Co., Inc., New Haven, Conn. Booth 379.
Photographs showing installations of the Standard patent scouring machine now in operation removing scale from hot-rolled and annealed strip steel and allied equipment such as pulling rolls, compressed air controlled, winders with independent foot treadle clutch control on each reel; new type of collapsible take-up reel with quick adjustable flange. Represented by: Charles A. Dreisbach, president; and Burton L. Hoskins, director.

Steel City Testing Laboratory, Detroit. Booth 102.

Stoody Co., Whittier, Cal. Booth 241.
Various welding rods and welding equipment, including grinders and electrode holders. Represented by: Robert L. Ozias and C. E. Phillips.

Strong, Carlisle & Hammond Co., Cleveland. Booth 209.
No. 659 Duralumin treating furnace having a connected load of 15 kw. single phase 110 volts, operating through a tapped transformer having three reduced capacity taps under 110 volts at 99, 88 and 77 volts. Element, ribbon resistor of low watt density. Leeds & Northrup automatic temperature control. Represented by: G. S. Peterson, sales manager furnace department; Jacob Weintz and A. B. Lindsay.

D. A. Stuart & Co., Chicago. Booth 78.
Various parts machined with new type metal working oils; Bottles containing samples of principal well-known Stuart products, this list including Stuart's Thred-Kut oil, Super-Kool base oil; Codol liquid grinding compound, Kleen-Kut soluble oil, Drawsol deep drawing compound, No. 34 soluble quenching oil. Represented by: C. H. Baker, G. A. Dudley, W. M. Duncan, W. H. Huelster, T. B. Langdon, director of sales; and W. H. Oldacre, director of engineering and research.

Sullivan Machinery Co., Chicago. Gas Section.

Surface Combustion Co., Toledo. Gas Section.
Heat treating furnace equipment with automatic temperature control; surface combustion burners and inspirators and their application; newly-designed forging furnace. Represented by F. H. Adams, vice-president and general manager; C. B. Phillips, vice-president and general sales manager; C. H. Blesch, A. L. Hollinger, W. O. Owen, Eugene A

Weaver, F. H. Trembly, S. R. Anderson, J. M. Brown and O. R. Olson.

T

Taylor-Winfield Corporation, Warren, Ohio. Booth 244.
Both spot and butt welding equipment and a portable type of spot welding machine. Represented by: F. C. Terry and engineers from main plant.

Thompson Grinder Co., Springfield, Ohio. Booth 378.
R. R. Moore fatigue testing machine running tests on various metals and their alloys. Specimens will be exhibited from parts taken from actual service failures, such as aeroplane propellers, struts, crank shafts, oil tubes, etc. The effect of various shapes of specimens such as grooves, threads, fillets, will be illustrated by the test run. Represented by W. G. Baldenhofer and R. R. Baldenhofer.

Timken Steel & Tube Co., Canton, Ohio. Booths 24 and 36.
Moving exhibit illustrating the use of Timken steel and the services available through the Timken company. Represented by: M. T. Lothrop, president; A. J. Sanford, vice-president in charge of sales; W. G. Hildorf, chief metallurgist; R. L. Wilson, Robert Atkinson and Walter Wiewel.

Toledo Scale Co., Toledo, Ohio. Booth 328.

Tomkins-Johnson Co., Jackson, Mich. Booth 369.
Die sinking milling cutters; air-operated chucks and cylinders. Represented by: R. B. McDonald, sales manager; A. R. Johnson, treasurer; and H. A. Tomkins, president.

Torchweld Equipment Co., Chicago. Booth 264.
Torchweld hand welding torches; Torchweld machine welding torches; Torchweld hand cutting torches; Torchweld machine cutting torches; Torchweld decarburizing equipment; Torchweld leadburning equipment; Torchweld acetylene generators; Torchweld gas pressure regulators; and accessories and supplies. Represented by: W. A. Slack, president; R. M. Smith, assistant sales manager; H. G. Larisch, C. E. Davis and W. E. Lyons.

Harold E. Trent Co., Philadelphia. Booth 341.
Electric furnaces and temperature control for heat treating, pit type, pot type, oil quench type furnaces. Represented by: H. E. Trent.

U

Una Welding & Bonding Co., Cleveland. Booth 261.
Una welders, both AC-dc and DC-dc types. Una automatic welding head; complete line of Una welding rods for manual and automatic welding. Represented by: E. R. Alexander, E. W. Kronbach, A. A. Probeck, H. P. Blum, W. J. Bushea, L. S. Burgett and J. P. Austin.

United Engineering Society (Endowment Committee), New York. Booth 435.
Large photographs and diagrams.

V

Vanadium Alloys Steel Co., Latrobe, Pa. Booths 10, 12, 39 and 41.
Red Cut superior high-speed steel; Non-shrinkable die steel; Marvel hot working die steel; choice hot working die steel; Colhed, a new steel recently developed for cold heading; Crocar, a new high carbon high chromium steel; fractures and tools of above. Represented by: R. C. McKenna, president; Floyd Rose, vice-president; L. D. Bowman, works manger; J. P. Gill, R. B. George, W. R. Mau, W. D. Fisher, T. J. Van de Motter and C. V. Reilly.

Vanadium Corporation of America, New York. Booths 20 and 49.
Ferro-vanadium, ferro-chromium, ferro-silicon, and other steel-making alloys; ores; oxides; chemical compounds of vanadium, tungsten, molybdenum, chromium, and other rare and semi-rare metals; Vanadium steel forgings and castings. Represented by: J. A. Miller, general manager of sales; H. T. Chandler, N. Petinot, C. N. Dawe, C. B. Woodworth, T. N. Bourke, B. D. Saklatwalla, vice-president; Jerome Strauss, G. L. Norris and A. W. Demmler.

Van Dorn Electric Tool Co., Cleveland. Booth 35.
Portable electric drills; grinders; reamers; tappers; screw drivers; nut setters; stationary grinders; electric socket wrenches; and portable electric hammers. Represented by: F. Schneider, president; F. H. Zulauf, vice-president and general manager; R. W. Procter, sales manager; E. W. Waechter, assistant sales manager; S. S. Waters, L. L. Charnicky, F. R. Du Guay and F. H. Schell.

Victor-Peninsular Division, Detroit. Booth 274.

Victor X-Ray Corporation, Chicago. Booth 322.
Extensive display of X-ray negatives, showing imperfections in materials, such as castings, welding and assemblies. Illustrating the value of X-ray in determining necessary changes in processes and the effects caused by such changes, as well as effects caused by the personal factor of the operators. Represented by: E. W. Page.

W

Water Treatment Co. of America, Pittsburgh. Booth 227.
Reception and literature. Represented by: Harry L. Baer, president; and George Neilson, vice-president.

Weidemann Machine Co., Philadelphia. Booth 6.
New patented spring winder; new forged steel vise; Eda multiple punch-press. Represented by: O. F. Weidemann and G. A. Hancock.

Weldit Acetylene Co., Detroit. Booth 242.
Welding and cutting (oxyacetylene) equipment and Gasavers. Represented by: O. L. Smith, president; J. B. Manor and J. Bronson.

Westinghouse Electric & Mfg. Co., East Pittsburgh. Booth 305.
Weldomatic automatic welding outfit shown for the first time, including the new type head, the control and the operator's panel. This set is in operation on pipe seam welding, and a 400-amp. welding set will supply the current to this automatic welding set; pipe handling tool which adjusts the pipe for automatic welding; 200-amp. portable motor-driven welding set; 200-amp. portable gas engine-driven welding set; 400-amp. portable motor-driven welding set. Represented by: W. W. Reddie, R. L. Cronemeyer, G. H. Koch, F. M. Bernard, W. G. Pearson, C. W. Babcock and P. H. Grunnagle.

Wheeling Mold & Foundry Co., Wheeling, W. Va. Booth 400.
Model steam hammer showing application of steel and alloy steel castings, dies and die blocks; representative test specimens; and sections of alloy rolls and castings. Represented by: H. E. Field, president; E. A. Balsley, vice-president; R. C. Heaslett, D. Wyman and George Chandler.

Wheelock, Lovejoy & Co., Inc., Cambridge, Mass. Booths 84, 86 and 88.
Moving pictures of various activities in different warehouses, such as loading, cutting, testing, heat treating, etc. Represented by: A. Oram Fulton, president; Frederick H. Lovejoy, vice-president; George S. Longley, Jr., Edward C. Bartlett, Stanley W. Parker, C. Robert Jenks, Murray N. Allison, George A. Baron, Henry A. Bischoff, A. Reed Townsend and Floyd J. DeVan.

Whitman & Barnes, Inc., Detroit. Booth 83.
Complete line of drills, reamers, milling cutters and end mills, mounted on display boards. Represented by: Fred J. Smith and E. T. Oliver.

Wickwire Spencer Steel Co., New York. Booths 238 and 240.
Wisscoloy spiral conveyor belt traveling through an electric furnace operating at from 1800 to 2000 deg. Fahr. Samples of Wissco oil-tempered valve spring wire and a special valve spring wire made from an imported Swedish stock will be tested in a Tinius Olsen testing machine. Samples of a special tempering wire and music wire will also be tested. Represented by: F. W. Hale, sales manager, wire conveyor belts department; Dwight Granger, chief engineer; Jay R. Worsfold, sales manager; E. C. Stout, sales manager, spring department; R. H. Clapp, sales manager, wire department; U. V. Westover, G. W. Nelson, V. C. King, M. G. Werme, E. F. Early, R. R. Tatnall, R. C. Jordan and F. J. Connors.

Williams & Co., Inc., Cleveland. Booth 243.
Williams gas and electric and Wilson Welder & Metal Co. Colortipt welding rods. Metals which may be observed in welding operation are soft, medium and high carbon steels, cast iron, brass, bronze and copper, monel metal, nickel and aluminum. Represented by: E. C. Edmundson, general manager; W. J. Lyons, N. J. Carbis, J. H. Penske, Jr., K. J. Burkholder, B. F. Prentiss, H. M. Turner, Wilson Welder & Metals Co., engineers.

Willson Products, Inc., Reading, Pa. Booth 251.
Perfection of its glass in its ability to stop harmful rays by means of a galvanometer and thermocouple is shown. Represented by: F. H. Klein.

Wilson-Maeulen Co., Inc., New York. Booth 405.
Indicating pyrometers; recording pyrometers; automatic temperature controllers; electric resistance thermometers; and Rockwell hardness testers. Represented by: John P. Roberts, Harvey Lee, G. B. Duff, M. A. Schreiner, F. Walter and C. E. Hellenberg.

Z

Ziv Steel & Wire Co., Chicago. Booths 66 and 87.

Twenty Years of Alloy Steels

Last Year's Output Nearly 3¼ Million Tons—Electric Alloy Castings a Feature—Some Factors in Establishing Alloy Industry

BY EDWIN F. CONE*

EXCEEDING for the first time 3,000,000 gross tons, American production of alloy steels in 1928 made some unusual records. At 3,214,909 tons, it was larger than the previous year's total, which was a record, by over 683,100 tons, or 27 per cent. With the exception of the year 1922, following the depression in 1921, this is the largest expansion for any one year in the industry's history. In a 20-yr. period, a new industry has been created. This large growth has been signalized by a large expansion in electric alloy steel, particularly electric alloy castings.

In 1924 it was regarded as noteworthy that the total of alloy steel passed 5 per cent of the country's entire steel production. In 1928 the proportion went over 6 per cent, or to 6.23 per cent. The figures are shown in Table I.

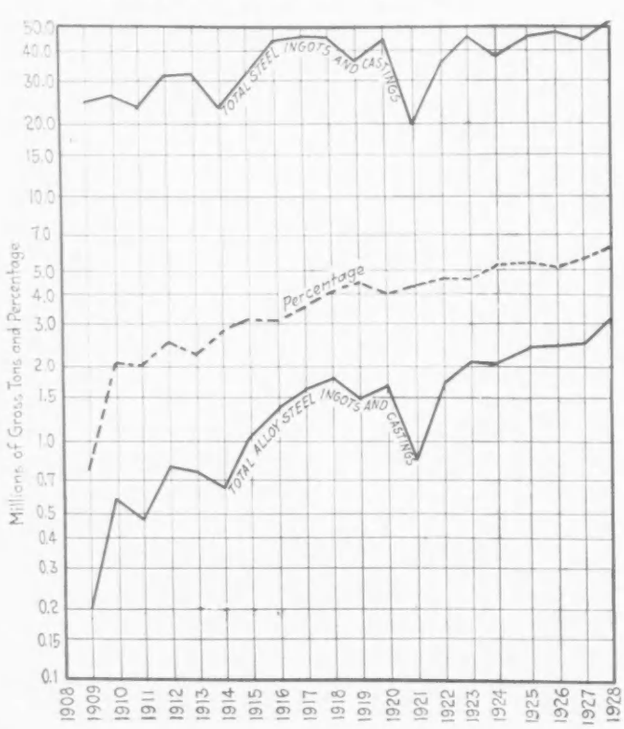
More Electric Alloy Steel Castings

AS to electric alloy steel castings, the expansion which started in 1921 and to which attention was called in an article similar to this, in THE IRON AGE of Sept. 3, 1925, has continued on a rapidly rising scale. From 10,084 tons in 1921 it went to 28,821 tons in 1924, and advanced last year to 79,434 tons, as shown in Table IV. In round numbers, output was 15 per cent of all the electric alloy steel in 1924, and 18 per cent in 1928. It trebled in the three years from 1921 to 1924 and was eight times as much in 1928 as in 1921.

One cause for the expansion, and operative for some years, continues—greater use of heat-treated electric alloy castings for such service as is performed by forgings. Other factors are increased demand for manganese electric castings and for rustless iron and similar castings. Ability to heat treat these has been a development in quite recent years, resulting also in a broadening demand. Quenching steel castings, recently thought impossible, is now regular practice in some foundries.

As to electric alloy steel as a whole, the last four years has been featured by largely augmented consumption. In 1924 the production of alloy steel (Table III) made in electric furnaces was 188,563 tons, or 9.3 per cent of all

*Associate editor, THE IRON AGE, New York.



HOW the Proportion of Alloy Steel to the Total Steel Produced Has Been Gradually Increasing. This ratio chart makes the rates of fluctuation truly comparable

Table I—Production of Alloy Steel Ingots and Castings in the United States

	Alloy Steel, Gross Tons	Total Steel, Gross Tons	Alloy Steel of the Total, Per Cent	Tons of Total Steel to 1 Ton Alloy Steel
1909	181,980	23,955,021	0.75	131.6
1910	567,819	26,094,919	2.17	45.9
1911	481,459	23,676,106	2.03	49.1
1912	792,501	31,251,303	2.53	39.4
1913	714,357	31,300,874	2.28	43.8
1914	646,953	23,513,030	2.75	36.3
1915	1,021,147	32,151,036	3.17	31.4
1916	1,362,615	42,773,680	3.18	31.3
1917	1,644,335	45,060,607	3.65	27.4
1918	1,787,852	44,462,432	4.02	24.8
1919	1,481,188	34,671,232	4.27	23.4
1920	1,660,292	42,132,934	3.94	25.3
1921	809,548	19,783,797	4.10	24.3
1922	1,673,496	35,602,926	4.70	21.3
1923	2,106,489	44,943,696	4.70	21.3
1924	2,026,409	37,931,939	5.35	18.7
1925	2,432,973	45,393,524	5.36	18.6
1926	2,463,414	48,293,763	5.10	19.6
1927	2,531,748	44,935,185	5.59	17.7
1928	3,214,909	51,544,180	6.23	16.0

Table II—Production of Alloy Steel Castings in the United States

	Total Alloy Castings, Gross Tons	Total Alloy Steel, Gross Tons	Percentage of Castings of Total
1909	23,002	181,980	12.64
1910	29,357	567,819	5.17
1911	56,290	481,459	11.69
1912	103,109	792,501	13.01
1913	88,927	714,357	12.44
1914	69,846	646,953	10.79
1915	97,896	1,021,147	9.58
1916	56,458	1,362,615	4.14
1917	67,529	1,644,335	4.10
1918	66,485	1,787,852	3.71
1919	45,372	1,481,188	3.06
1920	68,353	1,660,292	4.11
1921	40,255	809,548	4.97
1922	59,104	1,673,496	3.53
1923	92,220	2,106,489	4.37
1924	85,948	2,026,409	4.24
1925	112,583	2,432,973	4.63
1926	146,101	2,463,414	5.93
1927	145,844	2,531,748	5.72
1928	169,684	3,214,909	5.28

the alloy steel. In 1928 it had expanded over 2¼ times to 433,096 tons, or 13.47 per cent of the total, which in the same time had increased 58.5 per cent. In each of the last three years more alloy steel was made in electric furnaces than in 1918, while 20 years ago no electric alloy steel was reported.

Larger Demand for Alloy Castings

RECENT expansion in alloy steel castings, which includes electric, open-hearth and others, has been gradual but pronounced. At 169,684 tons in 1928, the total was nearly twice that of 1924 and the largest on record.

This review, based on data of the American Iron and Steel Institute, covers 20 years. At the beginning of that period practically no alloy steel was made on a commercial scale. The tonnage of high-speed steel was small. Last year not far from 3¼ million tons was made, with the possibility that this year it will approximate 3¾ millions.

Factors in 20 Years' Development

IN 20 years a large new industry has become flourishing, for today many various types of alloy steel are indispensable to other industries. These steels have helped to make possible the present day automobile. They are the basis for the high development of today's airplane. They are essential in the design and building of corrosion-resisting material of many kinds and have contributed to the revolution in certain methods of manufacture, such as nitric acid, oil cracking and so on. Their incorporation in the modern locomotive is of economic and engineering importance.

To the electric furnace we are indebted for ferroalloys and thus new steels, and for the melting of high-grade steels and the production of difficult ones; also for the efficient heat treatment of all types of steel. To heat-treating processes and equipment we are indebted for means to develop the best qualities in both old and new steels, carbon as well as alloy.

Progress in the last 20 years has been phenomenal. Heat treaters, who are celebrating next month, at a convention of a great society, eleven years of development, have even greater developments to look forward to—not only in steel, but also in aluminum and its alloys. In the latter field heat treatment is creating new products and a new industry.

Features of 20 Years' Progress in Alloy Steels

- In 1928 only 16 Tons of Total Steel to 1 Ton of Alloy: In 1909 this Ratio was 131.6 to 1.
- In 1928 over 3,000,000 Tons of Alloy Steels Produced: In 1909 About 182,000 Tons.
- In 1928 Electric Alloy Steel Castings Made Up Over 18 Per Cent of Total Electric Alloy Steel: In 1909 None Was Reported.

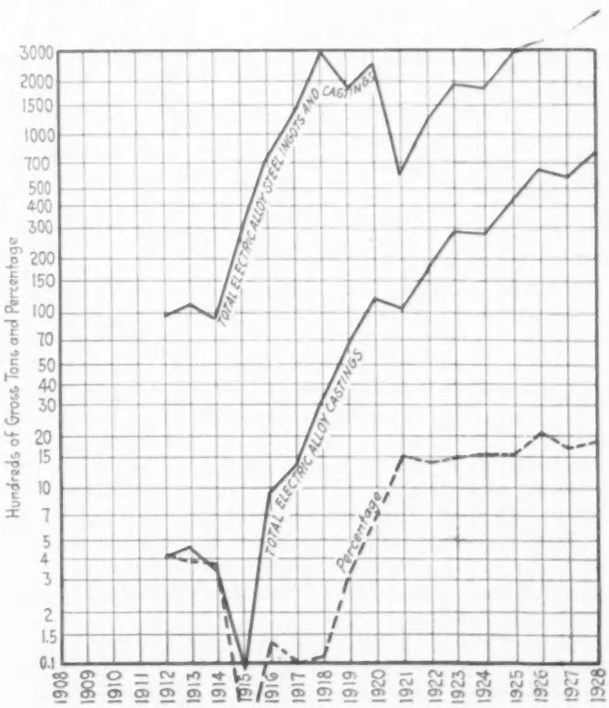
Table III—Production of Alloy Steel Made in Electric Furnaces in the United States

	Electric Alloy Steel, Gross Tons	Total Alloy Steel, Gross Tons	Electric Alloy Steel of Total Alloy Steel, Per Cent
1909	.....	181,980	....
1910	608	567,819	0.11
1911	.....	481,459	....
1912	9,619	792,501	1.21
1913	11,264	714,357	1.57
1914	9,344	646,953	1.44
1915	27,944	1,021,147	2.73
1916	71,129	1,362,615	5.22
1917	130,578	1,644,335	7.94
1918	290,961	1,787,852	16.26
1919	181,632	1,481,188	12.26
1920	245,572	1,660,292	14.78
1921	63,246	809,548	7.81
1922	125,419	1,673,496	7.49
1923	194,976	2,106,489	9.25
1924	188,563	2,026,409	9.30
1925	293,780	2,432,973	12.00
1926	306,811	2,463,414	12.45
1927	343,517	2,531,748	13.57
1928	433,096	3,214,909	13.47

Table IV—Production of Alloy Steel Castings Made in Electric Furnaces in the United States

	Electric Alloy Castings, Gross Tons	Total Electric Alloy Steel, Gross Tons	Electric Alloy Castings of Total Alloy Steel, Per Cent
1909	.....	.....	....
1910	8	608	1.32
1911	.....	.....	....
1912	402	9,619	4.18
1913	443	11,264	3.93
1914	340	9,344	3.64
1915	96	27,944	0.34
1916	926	71,129	1.30
1917	1,296	130,578	0.99
1918	3,076	290,961	1.05
1919	6,057	181,632	3.33
1920	11,710	245,572	4.77
1921	10,084	63,246	15.94
1922	17,760	125,419	14.20
1923	29,054	194,976	14.90
1924	28,821	188,563	15.25
1925	44,406	293,780	15.10
1926	64,003	306,811	20.86
1927	59,157	343,517	17.22
1928	79,434	433,096	18.34

Hard wearing metal, to replace worn surfaces of rails, conveyor flights, gear teeth and the like, is deposited by the electric arc (according to a process developed by Alloy Welding Processes, Ltd., of England), using a mild steel electrode, covered with a proper compound of manganese. Alloying into a hard, tough, manganese steel occurs simultaneously with deposition of the weld material.



CASTINGS of Electric Alloy Steel Have Been Increasing Rapidly in Tonnage and in the Percentage of All Alloy Steel Made in Electric Furnaces

Calculations for Bending Rolls

Establishing Diameter with Definite Deflection and Unit Stresses, and Determination of the Limiting Conditions

BY RENE TILKIN*

METHODS generally used for calculating the diameters of the rolls of a bending machine, to bend a certain plate to a given diameter, are of the cut-and-try type. The results obtained are far from accurate. Our purpose is to elaborate formulas which will permit calculating those diameters with great accuracy, and with little expenditure of time.

When establishing a series of rational bending machines the starting point for calculating the diameters of the rolls is not the stress in the metal, but rather the deflection per unit of length of the rolls, due to the application of the bending force to the plate. The deflection of the rolls should be small enough so that the resulting deformations of the plate are not prejudicial to their use.

Some specialists have tried to avoid the effect of the deflection by giving the contour of the rolls a form approximately like the curve caused by the deflection. It is doubtful if this practice is justified. It gives rolls of such a form that the side in contact with the plate becomes a straight line at the end of the bending operation, when rolling the thickest and widest plate for which the machine is calculated.

At any other moment of the rolling, and for all other dimensions of plates, the curve remains in the rolls, thus causing the plate to bear on one point only on each roll; the driving is incorrect and deformations are unavoidable. Moreover, finishing the rolls to an exact shape is rather difficult, and the increased labor costs more than offset the benefits derived from a decreased weight of the rolls. Furthermore, the thinner plates will be handled with the least deformation on machines provided with rolls having a very small deflection, and this is the most frequent requirement.

Having thus stated the conditions of the problem, we will solve it for a bending machine with three rolls disposed as in Fig. 1. The factors which apply to these types of machines are:

1. Elastic limit of the metal of the plate to be rolled: 32,000 lb. to the square inch (for steel).

2. Maximum stress in the plate at the end of rolling: 45,000 lb. to the square inch (for steel).

3. Modulus of elasticity of the roll metal: 29,000,000.

4. Smallest diameter to which the plate may be rolled: 1½ times the diameter of the roll around which the plate wraps itself.

All calculations are made for the moment of greatest stress, such moment being obtained when rolling the heaviest plate to the smallest diameter. The load on the upper roll then is equal to the force required to bend the plate in its middle point, the plate being supported by the bottom rolls at points which are tangential points of the bent plate in the rolls.

The curvature of the plate modifies that load a little, but the difference may safely be ignored. We may neglect also the deflection due to the weight of the rolls, as well as the small difference (clearance) between the width of the greatest plate to be rolled and the length of the rolls. In the figures the plate is supposed without thickness and represented by a line.

Fixed Relations Established

MR. TILKIN'S equations establish a series of relationships between the main dimensions of the rolls used in bending steel plates. Summarized, these are as follows:

Diameter of single (upper) roll is 1.136 times that of each of the two lower rolls.

Distance between bearing lines of plate on lower rolls is 0.945 of the diameter of the lower rolls, when the latter are 1.5 diameters apart.

Stresses induced in the rolls are a function of the thickness and the width of the plate being bent. Critical conditions, explained in the text, are found when the width reaches 79 times the thickness, and again at 109 times the thickness.

Bending Machine With Three Rolls

For three-roll machines the distance between the center-lines of the lower rolls may be taken equal to 1½ times their diameter. We may allow a deflection of 0.012 in. for each foot length of the rolls. The flexure stress of the rolls should not exceed 17,000 lb. to the square inch. The following symbols will be used hereafter:

Diameter of the bottom rolls	d (inches)
Diameter of the upper roll	D (inches)
Thickness of the plates to be rolled	E (inches)
Moment of inertia of the bottom rolls	i
Moment of inertia of the upper roll	I
Stress in the bottom rolls	r (lb. per sq. in.)
Stress in the upper roll	R (lb. per sq. in.)
Length of the rolls (this length being supposed equal to the width of the greatest plate)	L (inches)
Bending force required on each bottom roll	f (pounds)
Bending force required on the upper roll	F (pounds)

Ratio of the Diameters of the Rolls

It may be shown that the ratio D/d of the diameters of the upper and bottom rolls is a constant, if we assume the deflection to be the same on all rolls. The value of this constant depends only on the distance between the center-lines of the bottom rolls, and on the minimum diameter to be rolled on the machine. If $\frac{D}{d}$ is α, then $D = \alpha d$.

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Let us analyze force F (Fig. 2) with its components $f\,f$ on the bottom rolls. The distance $M\,O$, between center of curvature of plate and center of each bottom roll, is $0.5\,d + 0.75\,\alpha\,d$.

Then $$\frac{F}{f} = \frac{y}{0.5\,d + 0.75\,\alpha\,d} = \frac{y}{d\,(0.5 + 0.75\,\alpha)} \qquad (1)$$

On the other hand, in triangle MOB,

$$\left(\frac{y}{2}\right)^2 = (0.5\,d + 0.75\,\alpha\,d)^2 - (0.75\,d)^2$$

whence $y = 2\,d\,\sqrt{0.5625\,\alpha^2 + 0.75\,\alpha - 0.3125}$

Introducing this value of y in equation (1),

$$\frac{F}{f} = \frac{2\,\sqrt{0.5625\,\alpha^2 + 0.75\,\alpha - 0.3125}}{0.5 + 0.75\,\alpha} \qquad (2)$$

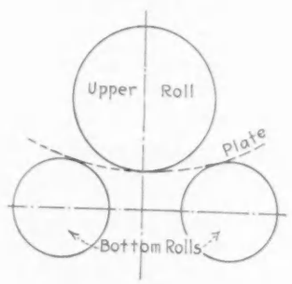


Fig. 1 — General Relations of the Three Rolls Constituting a Set and the Plate Being Bent

The condition for having the same deflection on all rolls is:

$$\frac{5\,F\,L^3}{384\,E\,I} = \frac{5\,f\,L^3}{384\,E\,i} \qquad (3)$$

Which, by simplifying, becomes

$$\frac{F}{f} = \frac{I}{i} \qquad (4)$$

But for a circle $I = \frac{\pi\,(\alpha d)^4}{64}$ and $i = \frac{\pi d^4}{64}$; hence $\frac{F}{f} = \alpha^4$.

Introducing this value for $\frac{F}{f}$ in equation (2), we obtain:

$$\alpha^4 = \frac{2\,\sqrt{0.5625\,\alpha^2 + 0.75\,\alpha - 0.3125}}{0.5 + 0.75\,\alpha}$$

from which $\alpha = 1.136$.

The problem now is simplified, since we need only calculate the diameter of the bottom rolls. Multiplying this value by 1.136 will give the diameter of the upper roll.

Diameter of the Bottom Rolls

To find the diameter of the bottom rolls we must first establish the equation of the following three conditions, the unknown quantity being the diameter d:

(1) Force F required on the upper roll.

(2) Stress of the metal per unit of surface on the upper roll, R.

(3) Maximum deflection in the middle of the upper roll.

We should first find x, the distance (see Fig. 2) between the bearing points on lower rolls of the heaviest plate when it is rolled to the smallest diameter.

$$\frac{x}{1.5\,d} = \frac{0.75\,\alpha\,d}{0.75\,\alpha\,d + 0.5\,d}$$

Substituting 1.136 in place of α,

$$x = 0.945\,d$$

We now can write the equations:

$$\frac{0.945\,d\,F}{4} = \frac{L\,e^2}{6} \times (45{,}000) \qquad (5)$$

$$\frac{F\,L}{8} = \frac{3.14\,(1.136\,d)^3}{32} \times R \qquad (6)$$

$$\frac{0.012\,L}{12} = \frac{5\,R\,L^2}{24 \times 29{,}000{,}000 \times 1.136\,d} \qquad (7)$$

from (5), $F = \frac{31{,}750\,L\,e^2}{d}$ or $F\,d = 31{,}750\,L\,e^2$ (8)

from (6), $F\,L = 1.152\,d^3\,R$ (9)

from (7), $R = \frac{158{,}100\,d}{L}$ (10)

If, in equation (9), R is replaced by its value as found in (10),

$$F\,L^2 = 182{,}000\,d^4 \qquad (11)$$

and dividing equation (8) by (11),

$$\frac{d}{L^2} = \frac{31.750\,L\,e^2}{182{,}000\,d^4}$$

whence:

$$d^6 = 0.174\,L^3\,e^2 \qquad (12)$$

Taking the logarithmic value of both members of equation (12),

$$\log d = \frac{3\log L + 2\log e - 0.76}{5} \qquad (13)$$

This formula enables us to calculate the diameter of bottom rolls of a bending machine for rolling a steel plate of all lengths and thicknesses, under the conditions set forth above.

It is, however, necessary to check the stress R of the metal of the upper roll and r of the bottom roll, in case their values should exceed the permissible limit. First will be found the ratio R/r. The general formula for the stress of a beam uniformly loaded gives the system:

$$\begin{cases} \frac{F\,L}{8} = \frac{3.14\,(1.136\,d)^3\,R}{32} \\ \frac{f\,L}{8} = \frac{3.14\,d^3\,r}{32} \end{cases}$$

Dividing the first equation by the second,

$$\frac{F}{f} = \frac{(1.136)^3\,R}{r} \qquad (14)$$

but, according to equation (2), replacing α by its value 1.136 gives

$$\frac{F}{f} = \frac{2\,\sqrt{0.5625 \times (1.136)^2 + 0.75 \times 1.136 - 0.3125}}{0.5 + 0.75 \times 1.136} = 1.664$$

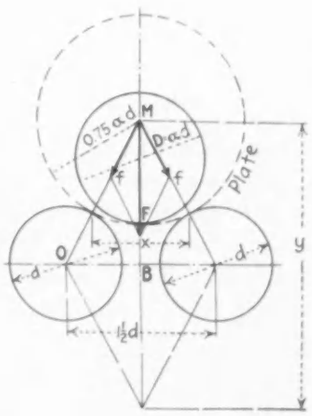


Fig. 2 — Schematic Arrangement of Rolls and Plate, with Relative Dimensions and Clearances as Explained in the Text

and replacing $\frac{F}{f}$ by its value as found in (14)

$$\frac{R}{r} = \frac{1.664}{1.466} = 1.136 \text{ or } r = 0.88\,R \qquad (15)$$

The value of R is found by using equation (10).

Cases When the Stress of the Rolls Is Too Great

When checking the values of r and R by means of equations (10) and (15) it is often found that the limit of 17,000 lb. to the square inch is exceeded for one or both of these values. That would be the case for the upper roll when the ratio $\frac{L}{d}$ is below $\frac{158{,}100}{17{,}000} = 9.3$ (see equation 10). It would be the case for the three rolls when the ratio $\frac{L}{d}$ is below $\frac{158{,}100 \times 0.88}{17{,}000} = 8.18$ (see equation 10, combined with 15).

From equation (12),

$$\frac{d^3}{L^3} = 0.174\,\frac{e^2}{L^2} \text{ or } \frac{L^3}{d^3} = \frac{5.76\,L^2}{e^2}$$

From $5.76\,\frac{L^2}{e^2} = (9.3)^3$, we find $L = 109\,e$

From $5.76\,\frac{L^2}{e^2} = (8.18)^3$, we find $L = 79\,e$

Thus it follows that:

(Case 1) If the width of the plate is equal to (or greater than) 109 times its thickness, formula (13) may be used as it is.

(Case 2) If the width of the plate is between 109 and 79 times its thickness, the diameter of the upper roll must be increased to reduce the stress in the metal.

(Case 3) If the width of the plate is equal to (or smaller than) 79 times its thickness, the diameters of all three rolls should be increased.

Special Formulas for Case 2

To determine the diameter of the upper roll, the equation of the diameter should be found as a function of the stress of the metal only. From equation (5),

$$F = 31{,}750\,\frac{L\,e^2}{d}$$

Replacing F by this value and $1.136\,d$ by D in equation (6),

$$31{,}750\,\frac{L\,e^2\,L}{d\,8} = \frac{3.14\,D^3\,R}{32}$$

$$\text{or } D^3 = 2.39\,\frac{L^2\,e^2}{d} \text{ and } D = 1.335\,\sqrt[3]{\frac{L^2\,e^2}{d}} \qquad (16)$$

Special Formulas for Case 3

When the stress in all three rolls exceeds the permissible stress, one must try to find the diameters without taking into account the deflection per unit of length of the rolls. The results obtained with equation (15) are too great, and the deflection of the rolls will be diminished by increasing their diameter. The diameters must be found with respect to an equal stress in all three rolls, rather than with respect to equal deflection. This will be done by the same method as was used to establish the principal equation (13).

Ratio of the Diameter of the Rolls

In the case of an equal stress, the ratio $\frac{D}{d}$ is a constant when the distance of the center-lines of the bottom rolls is $1\frac{1}{2}\,d$, and when the smallest diameter of the bend of the plate is $1\frac{1}{2}$ times the diameter of the upper roll.

Let us write $\frac{D}{d} = \phi$, then $D = \phi\,d$.

From Fig. 2, the conditions for writing equation (2) are still the same, thus:

$$\frac{F}{f} = \frac{2\,\sqrt{0.5625\,\phi^2 + 0.75\,\phi - 0.3125}}{0.5 + 0.75\,\phi}$$

The stress in the upper roll is given by equation

$$\frac{F\,L}{8} = \frac{3.14\,D^3}{32}\,R, \text{ which gives } R = \frac{32\,F\,L}{8 \times 3.14\,D^3}$$

The stress in the bottom rolls is

$$\frac{f\,L}{8} = \frac{3.14\,d^3}{32}\,r, \text{ which gives } r = \frac{32\,f\,L}{8 \times 3.14\,d^3}$$

But, for the condition $R = r$,

$$\frac{32\,F\,L}{8 \times 3.14\,D^3} = \frac{32\,f\,L}{8 \times 3.14\,d^3}, \text{ which gives } \frac{F}{f} = \frac{D^3}{d^3} \qquad (17)$$

and replacing $\frac{F}{f}$ and D^3 by their values,

$$\phi^3 = \frac{2\,\sqrt{0.5625\,\phi^2 + 0.75\,\phi - 0.3125}}{0.5 + 0.75\,\phi}$$

This latter equation gives as the constant

$$\phi = 1.19$$

Research for the Bottom Rolls

To find the diameters of the bottom rolls we may consider the following two conditions under the form of algebraic equations, the unknown quantity being the diameter d:

1. Force required on the upper roll.
2. Stress of the metal per unit of area of the upper roll. To find x for $\phi = 1.19$:

$$x = \frac{0.75\,\phi \times 1.5\,d}{0.75\,\phi + 0.5} = 0.953\,d$$

The two equations may be written

$$\text{A)}\ \frac{0.953\,d\,F}{4} = \frac{L\,e^2}{6} \times 45{,}000$$

$$\text{B)}\ \frac{F\,L}{8} = \frac{3.14\,(1.19\,d)^3 \times 17{,}000}{32}$$

From (A), $F = \frac{L\,e^2 \times 45{,}000 \times 4}{6 \times 0.953\,d} = \frac{31{,}500\,L\,e^2}{d}$

and substituting in (B),

$$\frac{31{,}500\,L^2\,e^2}{8\,d} = \frac{3.14 \times 1.566\,d^3 \times 17{,}000}{32}$$

or $d^4 = 1.507\,L^2\,e^2$, whence $d = 1.108\,\sqrt{L\,e}$ (18)

Examples

We shall examine the following three cases:

1. Thickness of the plate ½ in.; width 6 ft.; ratio $\frac{L}{e} > 109$

2. Thickness of the plate ¾ in.; width 5 ft. 6 in.; ratio $109 > \frac{L}{e} > 79$

3. Thickness of the plate 1 in.; width 5 ft.; ratio $\frac{L}{e} < 79$

Case 1. Applying equation (13),

$$\log d = \frac{3\,\log 72 + 2\,\log 0.5 - 0.76}{5} = 0.8418$$

whence $d = 7$ in.; we derive from it $D = \alpha\,d = 1.136 \times 7 = 8$ in.

$$\text{and } R = \frac{158{,}100\,d}{L} = \frac{158{,}100 \times 7}{72}$$

= 15,400 lb. to the square inch.

Case 2. Applying equation (13) for the bottom rolls,

$$\log d = \frac{3\,\log 66 + 2\,\log 0.75 - 0.76}{5} = 0.89$$

whence $d = 7\frac{3}{4}$ in.

Applying equation (15) for the upper roll,

$$D = 1.325\,\sqrt{\frac{66^2 \times 0.75^2}{7.75}} = 9.1 \text{ in.}$$

$R = 17{,}000$ lb. to the square inch and

$$r = 0.88 \times \frac{158{,}100 \times 7.75}{66} = 16{,}340 \text{ lb. to the square inch.}$$

Case 3. Applying equation (18) for the bottom rolls, $d = 1.108\,\sqrt{60 \times 1} = 8.58$ in. and $D = 1.19\,d = 10.21$ in. we have $r = R = 17{,}000$ lb. to the square inch.

High-Strength Brass Made in England

A high-tensile alloy, called P. M. G. brass, has been developed by Vickers-Armstrong, according to the *Engineer*, June 14. It contains no low-melting metals, and is comparable in cost to gun-metal, but of superior physical properties, as shown by the following figures:

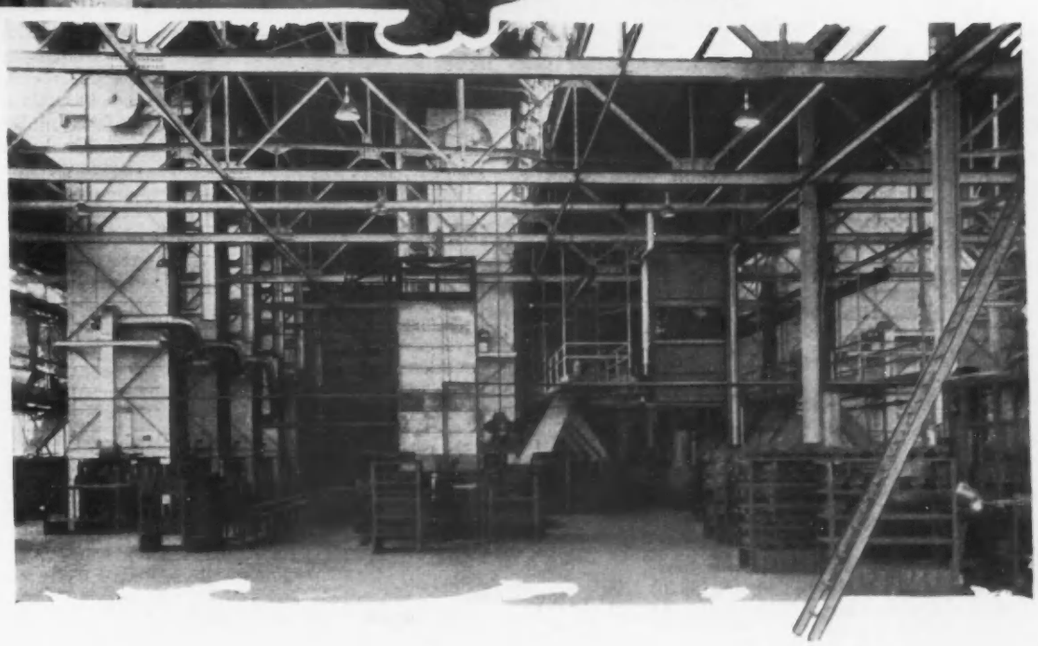
	Cast P.M.G. Brass	*Forged or Extruded* P.M.G. Brass	*Cast* Gun-metal
Specific gravity	8.39	....	8.82
Yield point lb. per sq. in.	24,500 to 30,000	45,000 to 50,000	18,000
Ultimate, lb. per sq. in.	40,000 to 50,000	75,000 max.	36,000 to 50,000
Elongation in 2 in.	18 to 8	42 to 38	28 to 8
Brinell hardness	100 to 115	....	75 to 95
Izod toughness ft.-lb.	20	36	14

Castings machined to wall thickness of ⅜ in. are watertight at 2000 lb. per sq. in. pressure. Strength is affected by elevated temperature less than gun-metal.

Cores Baked in Vertical Ovens

SIXTEEN vertical core ovens, 45 ft. high, are used in the Oakland foundry at Pontiac, Mich. These save a great amount of space in comparison with the horizontal type. Two illustrations show the making of crankcase cores and placing them on the trays of the oven. The third picture gives an indication of the great capacity of this unit and shows, at the same time, the unusual cleanliness of the room. Cores of this type are made two at a time on a roll-over machine. The cores are loaded four abreast in two rows on the trays, being placed there by the core-makers themselves, whose work is done closely around the oven. This eliminates use of racks and all necessity for aisles.

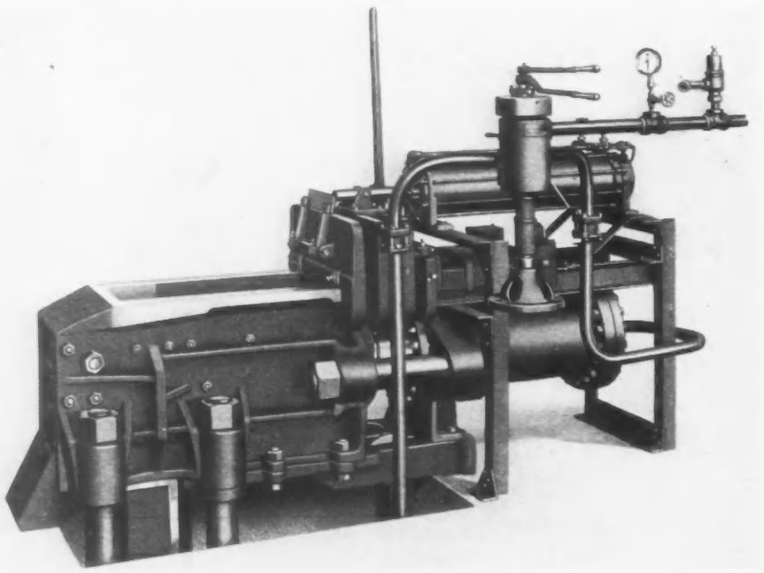
EACH Core-Maker Loads His Own Cores on the Furnace Trays. To this end the core-making benches are grouped closely around the furnaces



SEVERAL Vertical Core Furnaces Can Be Placed in the Space Which a Single Horizontal Furnace of Same Capacity Would Demand

Machine for Baling Forge Flashings

FORGE flashings and similar heavy material may be compressed into bales measuring 12 x 12 x 18 in. and weighing from 300 to 500 lb., on the heavy-duty hydraulic baling press illustrated, which has been brought out by the Galland-Henning Mfg. Co., Milwaukee.



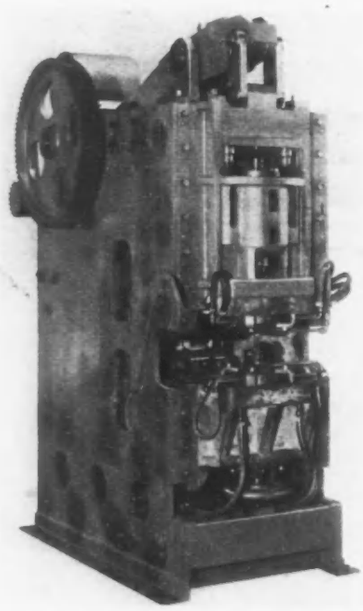
Flashings Are Compressed Into 12x12x18-In. Bales Weighing from 300 to 500 Lb.

The box into which the scrap is put is 48 in. long 18 in. wide and 36 in. deep. It is equipped with heat-treated steel liner plates to protect it from the cutting effect of the material to be baled, which is compressed under heavy lateral pressure. The rams are made large; the low-pressure or horizontal ram is of forged steel and the high-pressure or vertical ram is made of a special chilled material to eliminate scoring. The cover is air operated, a pneumatic hoist placed horizontally on the structural steel framework of the press being employed. The entire equipment is operated through a Nopak hydraulic valve, which requires no packing and makes use of an accumulator unnecessary. The lateral operating principle of this valve is said to assure effective operation and eliminate tendency of pounding, while under high pressure.

Heavy-Duty Power-Driven Vertical Welder

FOR welding light structural steel shapes and for multiple projection welding of medium and heavy stampings and forgings the Thomson Electric Welding Co., Lynn, Mass., is offering a new power-driven vertical machine.

The transformer is rated at 350 kva. Movement of the upper slide is obtained through a heavy rocking arm or lever actuated by cam. The camshaft is driven by a 4½-hp. four-speed motor through a speed reducer, the motor having push button control. The cam is large and has an insert that furnishes the final pressure on the weld. This insert is removable and can be shaped to suit various conditions. Dual pressure arrangement consisting of three springs, two light springs set in the upper slide head with a heavy spring between them, is said to permit lower welding currents than with one heavy spring. The light springs apply pressure at the time the current is turned on, and the heavy spring provides a positive bump or blow as the weld is finished, the pressure exerted by all three springs being adjustable. Mounting the springs directly over the work is intended to provide more sensitive pressure arrangement than otherwise.



Welder for Light Shapes, Forgings and Stampings

The knee of the machine is adjustable vertically to compensate for die wear or to accommodate work of different thicknesses. With the exception of the lower slide, upper terminal block and upper slide, all frame parts are made from arc welded steel plate and bar stock, the various units thus fabricated being either bolted or welded together. The weight of the machine, which is designated as the model 290, is approximately 10,000 lb.

Bench Grinder for General Shop Use

AN improved 1-hp. bench grinder equipped with either alternating or direct current motor that is controlled by a safety type switch located in the base of the machine is being manufactured by the Schauer Machine Co., Cincinnati.

The motor is entirely inclosed so that the machine may be used either for wet or dry grinding. With d.c. motor the 10 x 1-in. grinding wheels operate at 2000 r.p.m. and with an a.c. motor, at 1750 r.p.m. Wheel guards are of improved type, and the tool rests are mounted so that they may be adjusted readily to any position. End bells are designed to provide maximum working space between the motor housings and the wheels. The shaft is mounted in solid race double-row ball bearings that are inclosed in dust-proof housings and run in grease. The height from the base to the center of the wheels is 11 in. The weight of the machine is 162 lb.

The Bench Machine May Be Used for Wet as Well as Dry Grinding

Tool Steel Makers for 25 Years

The Columbia Tool Steel Co., Chicago Heights, Ill., celebrated the twenty-fifth anniversary of its incorporation on Aug. 25. Founders were E. T. Clarage, A. R. Waters and A. J. Scheid. A. R. Waters, who is still a resident of Chicago Heights, assumed the general managership of the company from the beginning and at the death of E. T. Clarage succeeded him as president. Mr. Waters retired from that post in 1925 and was succeeded by A. T. Clarage, son of the first president.

New Hydraulic Cam Grinder

Features Include Hydraulically-Controlled Timing Mechanism and Slow Down Work-Drive-Motor Control

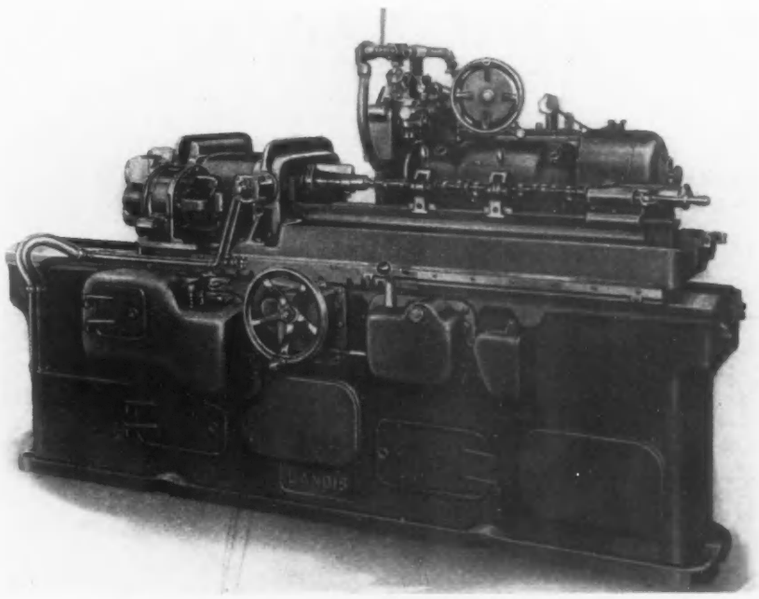
TO meet the demand for a cam grinder having automatic features that permit one operator to attend three or four machines, the Landis Tool Co., Waynesboro, Pa., has brought out the 5 x 40-in. grinder here illustrated. In addition to the timing mechanism, the work carriage traverse, wheel feed, work cradle and diamond wheel truing device are hydraulically actuated.

Although designated as semi-automatic, the machine is full-automatic after the grinding cycle for the first cam has begun. The operator simply dogs the cam shaft, places it in the machine, throws the quick-acting work-rest jaws into position, moves a lever to start the work rotating, and then throws the main control lever. The latter causes the work carriage to move, bringing the first cam to the grinding position, at which point the latch on the front of the bed drops into the first notch of a hardened plate on the front of the carriage. The oil pressure is immediately cut off from the carriage-traversing cylinder, and oil enters the hydraulic straight infeed cylinder, causing the wheel base to feed in rapidly. At the same time the oil pressure in the work crade cylinder is reversed, swinging the cradle back until the master cam comes in contact with the roller. By this time the grinding wheel has made contact with the work and the feeding-in movement has slowed down to the predetermined grinding speed. The wheel feed continues at the predetermined rate until the wheel-base comes against a positive stop, indicating that the work has been ground to size. Shortly before the end of the cut, the work speed slows down automatically, but the fast work speed is resumed again as soon as the cam is finished.

By the time the first cam has been ground to size, the timing cam has made one revolution, whereupon it trips the latch that causes the wheel-base to move backward rapidly to its starting position. The cradle then swings forward and the table traverses, bringing the second cam on the shaft into grinding position, where it stops as the latch enters the second notch in the notched plate. As the table brings the second cam to the grinding position, the master cam roller automatically indexes on its shaft so as to bring it in line with the second cam on the master. From this point on the cycle of operations is the same as with the first cam on the shaft, the cycle being automatically repeated for each cam, including the fuel pump cam, if that is used.

After the last cam on the shaft is finished the wheel-base moves to its extreme backward position, the work cradle swings away from the roller and the carriage moves a short distance and throws the main control lever, which stops all movements except work rotation. The arrangement is such that if the first shaft is ground from left to right, the second shaft may be ground from right to left, the automatic movements functioning the same with the work carriage traversing in either direction. The hydraulically driven wheel-truing device is arranged to permit quick truing of the wheel without disturbing the work.

Heavy and rigid construction together with accurate timing of the grinding cycle slow down work drive motor control and the other feature of the machine is said to result in work of unusual accuracy and finish. A 24-in. grinding wheel is employed, and end drive to the grinding wheel spindle is through multiple V-belts. A 15-hp. constant-speed motor is used for the main drive and a ½-hp. variable-speed motor for the work drive. The net weight of the machine, with both motors, is 10,000 lb. A d.c. generator may be mounted on the machine when direct current is not otherwise available.

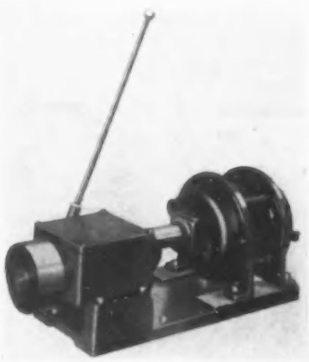


One Operator Can Attend Three or Four of the Cam Grinders

Roller-Bearing Speed Box for Garvin Tappers

TO increase the production and range of the Garvin No. 1 automatic tapping machine, the Western Machine Tool Works, Holland, Mich., has designed a Timken tapered roller bearing equipped speed box that provides three selective speeds. The unit may be obtained for either direct-connected motor drive or for single pulley drive, and may be adapted to any machine now in use.

Gears are made of chrome-nickel steel, heat treated and hardened, are of coarse pitch and run in a bath of oil. The ends of the gear teeth are rounded to facilitate engagement. The sliding cone gear has a long bearing on the shaft to prevent chattering and provide easy shifting. All shafts are ground and are equipped with fine thread nuts for close adjustment of the Timken bearings, which adjustment may be made from the outside of the box. Bearings, shafts, and shifter forks are lubricated by oil bath.



Motor-Driven Speed Box for Garvin Tapper

With a 12-in. driven pulley spindle speeds of 300, 400 and 600 r.p.m. are obtainable; with an 8-in. pulley, the speeds are 450, 600 and 900 r.p.m. For the motor-driven speed box a 1-hp. 1200 r.p.m. motor is recommended.

Hardinge Sales Co., Inc., New York, has been appointed exclusive distributer in the New York metropolitan area for the shop furniture division of the New Britain Machine Co., New Britain, Conn., manufacturer of pressed steel factory equipment.

Drop Forging Institute to Meet in September

The fall meeting of the American Drop Forging Institute will be held at Buckwood Inn, Shawnee-on-Delaware, Sept. 25, 26 and 27. A. C. Johnson, secretary of the Rockford Drop Forge Co., is president of the institute. The meeting will be addressed by Charles F. Abbott, executive director of the American Institute of Steel Construction, on the subject, "Rationalization of Production," and also by Dr. Zay Jeffries, director of research, United States Aluminum Co., on the subject, "Looking Toward the Future." There will also be papers on forging problems by some of its members.

C. H. Smith, president Steel Improvement & Forge Co., Cleveland, is chairman of the convention committee.

Gray Iron Institute Meets in October

The annual meeting of the Gray Iron Institute will be held at the Hotel Cleveland, Cleveland, Oct. 16. The various officers and committees will present plans for future procedure and discussions of various topics will be included in the program. Five directors will be elected for a three-year period and proposed changes in the by-laws will be voted upon. A group luncheon will be served at noon and the annual dinner will take place in the evening. A program is being arranged to follow the dinner.

On Oct. 15 the various committees and board of directors will hold meetings. Any member interested in the work of any of the committees is welcome to attend either the committee meetings or the meeting of the board of directors.

Ohio Foundrymen to Hold Sectional Meetings

Sectional meetings for the discussion of foundry problems will be held by the Ohio Foundrymen's Association, Inc., in place of the annual meetings, which have been held for a number of years. It is planned to hold four sectional meetings in different parts of the State at different times during the year. These sessions will take the form of luncheon meetings, and it is aimed to secure good speakers to talk on various subjects. After the talks there will be round table discussions to take up the remainder of the afternoon.

The meetings will be open to all members of the foundry industry throughout the State and also to foundrymen from neighboring States. The largest attendance naturally will come from the section in which the meeting is held. By having sectional meetings in different parts of the State it is expected that a larger attendance will be secured than at an annual meeting with a two-day session.

The first meeting will be held in Toledo late in September or early in October. With the adoption of this plan by the board of administration, the proposed plan of holding a two-day meeting on an Ohio River boat during a trip from Cincinnati has been abandoned.

27 Steel Vessels Under Construction

Steel vessels to the number of 27 were under construction in the United States on June 30, according to Lloyd's Register of Shipping. These represented a total of 119,098 gross register tons, a figure exceeded by construction under way in France, Germany, Great Britain, Japan, Netherlands and Russia.

Of the American ships building, one is of over 20,000 tons, two of between 10,000 and 15,000 tons, six between 8000 and 10,000 tons, four between 2000 and 4000 tons and nine under 2000 tons. The remaining five are barges averaging 1160 tons. Four of the ships, totaling 11,000 tons, are tankers, and 11, totaling 25,200 tons, are motorships.

Sees Active Business for Some Time

"Industrial and trade activity should continue at the present high rate for some time," the Conference of Statisticians in Industry, operating under the auspices of the National Industrial Conference Board, declares in its August report. The conference analysis emphasizes the improvement in building construction, which established a new high monthly record owing to extensive undertakings in public works, and points out that, although agriculture suffered considerable losses in certain sections, these were nearly balanced by bumper crops in other sections, so that the total purchasing power of agriculture for the year should come close to that of last year.

Exceptional activity in both industry and trade continued throughout the midsummer season, new July production records having been made in both the iron and steel and automobile industries, and building activity increased in spite of the fact that a seasonal decline would have been in order. Distribution as indicated by freight car loadings continued on the upgrade, increases being noticeable for all commodities excepting livestock during July.

The Davison Coke & Iron Co., Pittsburgh, on Aug. 1 fired the first battery of coke ovens at its Neville Island plant and will begin actual production of by-product coke within 60 days. The second battery of ovens will be lighted in about four weeks. The coke will be used as blast furnace fuel at the company's Neville stack and the furnace will supply slag to a nearby cement plant.

Industrial Analysis of Puget Sound District

Markets, manufacturing costs, supplies of raw materials and legal matters covering the Puget Sound district are taken up in some detail in a 48-page booklet recently issued by the Seattle Chamber of Commerce. The area specifically covered consists of the States of Washington, Oregon, Idaho and Montana.

In the booklet are shown the population and industrial growth of the district, production and purchasing power, transportation facilities, mineral output and the foreign trade. Under the heading of manufacturing costs are taken up, in order, problems of labor, power, fuel, taxes, and the question of factory sites and structures. Raw materials are briefly discussed, lumber being the largest manufacturing industry.

Minimum wages, interest rates, industrial insurance, securities acts and general laws covering corporations are discussed in several pages, while living conditions and certain miscellaneous data finish the work. All in all it gives a good picture of conditions in the district surveyed, and indicates possibilities lying ahead for manufacture and commerce.

Writes on Public Ownership

With the contention that public ownership means management by men inexperienced in business, Edward N. Hurley, chairman of the board, Hurley Machine Co., Chicago, and former chairman, Federal Trade Commission, war chairman, United States Shipping Board, and member World War Debt Commission, has prepared a brief monograph devoted to private and public ownership.

"I have observed," writes he, "that as a rule even poorly-managed private enterprises are better directed than are public concerns. The mental attitude of Americans expressed in continual complaint about city government and school administrations is significant evidence on this point. The fact that taxes go up, year after year, while the prices of many services decrease, as industries increase their efficiency, proves that 'hard facts' justify our chronic political grouch.

"A few years ago automobiles, radio sets and such things were luxuries, even for rich men. Now they are in reach of nearly every purse. But schooling costs more to the taxpayer and renter; justice in our courts is more and more a luxury."

A copy of Mr. Hurley's little article can probably be obtained from the Illinois Manufacturers' Association, 120 South La Salle Street, Chicago.

The Edward G. Budd Mfg. Co. Philadelphia has received a contract for all-steel bodies amounting to $30,000,000 or $35,000,000.

Railroads Want Reopening of Rate Case

Carriers Ask Commerce Commission for Reconsideration of Decision—Also Say Time Allowed Is Insufficient

WASHINGTON, Aug. 27.—Railroads have informed the Interstate Commerce Commission that they will seek a reopening of the general Eastern steel rate case, affecting rates on manufactured iron and steel throughout Official Classification territory, decided under the Hoch-Smith resolution. This step will be taken for the purpose of reargument and reconsideration respecting the level of the prescribed mileage scales and the port differentials. Also, they declared in a statement filed last week with the commission, they intend to file a revised petition for permanent fourth section (short haul) relief.

In their memorandum they declared that, owing to alleged contradictions and conflicts in the fourth section phase of the decision, they are unable to publish a mileage scale of rates without adequate fourth section relief, and request was made for postponement of the effective date, which the commission fixed at not later than Oct. 20.

Speaking through their tariff agents, the railroads said that the fourth section order incorporated in the decision was intended to establish rates over the direct routes and that if it were not possible to publish concurrently the rates over the indirect routes the old basis of rates might remain effective over the indirect routes for a period of six months after Oct. 20. It was stated that it would be impossible to publish the new rates over the direct and indirect routes within the time required.

The carriers said that the new fourth section order does not even grant temporary relief over the indirect lines in order to establish and maintain the new adjustments. Aside from what was termed "the chaotic and discriminatory situation" that would result from compliance with both the rate and fourth section order," which, it seems, would be equally as objectionable to the shipping public as it is to the carriers," the petitioners said that it would be impossible, even over certain direct routes, to publish and make effective, as prescribed, the scale of rates ordered or any other scale. It was stated that "there is 'irreconcilable' conflict between the rate making formula prescribed and the fourth section limitations imposed."

The claim was made that compliance with the fourth section order would disrupt and distort the scale of rates prescribed. To support this contention the petition said that there are instances where there will be fourth section departures on the only open working routes and that likewise there doubtless would be instances where there will be complication "even over the most direct working routes between two points."

The contention was set up that it was obviously in the public interest that the new rate structure be made effective simultaneously over all established routes. The time afforded was declared to be insufficient to permit such a course, even assuming that the restrictions could be otherwise complied with.

The commission, according to the petition, had entered a permanent fourth section order totally unadapted to and inconsistent with the rate structure prescribed without having had the hearing and full investigation recited in the permanent order. By reason of the alleged contradictory situation regarding the fourth section order, the agents said they were preparing a new fourth section application in order to make the relief adaptable to and consistent with the distance scales. The petition said that the carriers were not able to publish any mileage scale of rates without having adequate fourth section relief.

Review of the case also is to be asked, it was said, by petitions to be filed by shipper organizations.

Chicago-Milwaukee Reduced Steel Rate Suspended

WASHINGTON, Aug. 27.—The Interstate Commerce Commission has suspended from Aug. 23 to March 23, schedules of the Chicago & North Western, Elgin, Joliet & Eastern and Chicago, Milwaukee, St. Paul & Pacific railroads reducing rates on iron and steel products from the Chicago district to the Milwaukee district from 9.5c. to 8c. a 100 lb. The action followed protests from the East Side Manufacturers' Association, Granite City, Ill., the Laclede Steel Co., with plant at Alton, Ill.; the American Rolling Mill Co., Middletown, Ohio, and the Green Bay Association of Commerce, Green Bay, Wis. The protesting interests charged that the schedules would increase the advantage of iron and steel producers in the Chicago and Milwaukee districts.

The East Side Manufacturers' Association declared that through years of effort and expense its members had built up a material business at Milwaukee, Kenosha and Racine, Wis., despite the advantage of location enjoyed by competitors in the Chicago district. Prior to the decision in the Jones & Laughlin case, it was stated, Chicago possessed a rate advantage of 13.5c. but the finding in that proceeding increased Chicago's advantage to 15.5c. The proposed schedules, if permitted to become effective, it was contended, would set up a spread of 17c. against the East St. Louis district.

Under the decision in the general Eastern steel rate case, affecting all of Official Classification territory, the association pointed out that the disadvantage of the East St. Louis district would be 14.5c., exceeding by 5c. the disadvantage of that district under rates voluntarily established prior to the Jones & Laughlin decision. It was declared that the plan to increase the spread to 17c. would exclude East St. Louis producers from the Milwaukee market. Similar points were made by the Laclede Steel Co.

The American Rolling Mill Co. said the existing Chicago-Milwaukee rate of 9.5c. is unreasonable in view of the fact that under the C. F. A. scale the haul called for a rate of 18c. while under the Eastern rate case it would be 14c. This point also was made by the Green Bay Association of Commerce.

In defending their position, the railroads declared that the cut in the rate was necessary in order to meet fourth sections situations and that unless the rate were reduced steel would move from the Chicago district to the Milwaukee district by water. The carriers stated that it had been shown that the boats would take the traffic at 8c. a 100 lb.

Suggestions Invited for Manufactures Census

WASHINGTON, Aug. 27.—With a view to making the forthcoming census of manufactures as responsive as possible to the need of industry for accurate information concerning its own activities, the special advisory committee designated by Secretary of Commerce Lamont has requested manufacturing organizations, trade associations, and individual manufacturers for advice and suggestions as to the form of the schedule to be used in the enumeration.

The subjects covered by the schedule used in the 1927 census are: Description of establishment; character of industry; time in operation; persons engaged; salaries, wages, and materials; products; power; coal consumed. The committee has invited suggestions concerning the form of questions under all of these subjects except production, which will be taken up directly by the Bureau of the Census with the industrial associations.

In view of the fact that it will be necessary to begin the printing of the general schedule early next month, comments on the general schedule should be sent to the secretary of the committee, Thomas W. Howard, 1615 H Street, Northwest, Washington, as promptly as possible in order that they may be given consideration by the committee preparatory to recommending the revision of the schedule.

Not Much Activity in European Markets

British Holidays Slow Down Business—German Use of Machinery Increasing—Russia to Foster Manganese Ore Output

(*By Cable*)

LONDON, ENGLAND, Aug. 26.

CLEVELAND pig iron delivery delays are shorter as a result of the small holiday demand and increasing output. It is now possible to place orders for foundry grades for delivery in the second half of September. The fall outlook is still regarded favorably and prices are unlikely to recede, as raw material prices are firm. Hematite has a strong undertone, but selling prices are still less than production costs.

Finished steel is firm and most works on the Northeast Coast are resuming operations after the holiday with fair order books. Some apprehension, however, has been created by the weakness in Continental prices.

Tin plate is steady and mills are better engaged following some recent good buying and the accumulation of orders during the holiday stoppages. Most Welsh mills have now resumed operations and many are not prepared to accept less than 18s. 6d. ($4.49) per base box, f.o.b. works port. Further sales of tin plate have been made to the Continent and to South America, and Far Eastern users are interested. Galvanized sheets are quiet, but prices are steady. The black sheet market is dull.

The Buttweld Proprietary Co., with capital stock of £1,000,000, has been formed at Melbourne, Australia, to manufacture steel tubes by arrangement with Stewarts & Lloyds, Ltd., and the Broken Hill Proprietary Co.

Continental steel markets are easier and there is some pessimism among mills. French works are active on domestic orders, but Belgian, Luxemburg and German makers are seeking more business. The market is evidently affected by the holidays and the increase in output authorized by the International Steel Cartel.

The next meeting of the International Tube Cartel will be at Paris, Sept. 25 and 26. Despite dissolution of the European Hoop Iron and Tube Strip Cartel, the strip steel mills are still cooperating on prices for large contracts, and efforts are being made to renew the cartel.

Belgian output in July was 347,000 tons of pig iron and 345,000 tons of steel.

Holidays Affect British Market

Pig Iron Consumers Delay Fall Buying—Steel Export Quiet and Drop in Shipbuilding Contracts

LONDON, ENGLAND, Aug. 15.—August being a holiday month here, business generally is quiet and conditions can hardly be considered normal. This week, for example, is the recognized holiday in the Cleveland district, and although there appears to have been a demand for prompt shipment pig iron, consumers' stocks being depleted, inquiry generally has been sluggish. Users are inclined to delay committing themselves for fall requirements. The furnaces in that district, however, are preparing for further expansion of output in the belief that a heavy demand will develop before the winter. East Coast hematite prices are firmer, makers having little to sell for early delivery. Although there have lately been heavier imports of foreign ore into the Tees, a severe ore shortage is not yet impossible.

While there has been some foreign semi-finished steel bought, domestic output is still good. Some mills are fairly well engaged on orders and it is expected that before long some good tonnages will be placed. In finished iron and steel, apart from holiday interruptions, domestic demand continues moderate, but export inquiry is slack except for some business from India.

Some shipbuilding contracts have been made lately. Armstrong-Whitworth & Co. have taken two motor-driven tank ships of 9000

British and Continental European Export prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp with the £ at $4.85

British Prices, f.o.b. United Kngdom Ports

Cleveland No. 3 foundry	£3	12½s.	to	£3	13½s.	$17.58	to	$17.82
East Coast Hematite	3	15	to	3	15½	18.18	to	18.30
Ferromanganese, export	13	10	to	14	0	65.47	to	67.90
Billets, open hearth	6	7½	to	6	10	30.92	to	31.52
Sheets bars, open hearth	6	5	to	6	10	30.31	to	31.52
Black sheets, Japanese specifications	13	0				63.05		
Tin plate, per base box	0	18¼	to	0	18½	4.42	to	4.48
Rails, 60 lb. and heavier	7	15	to	8	15	37.59	to	42.43
						Cents per Lb.		
Steel bars, open hearth	7	15	to	8	10	1.67	to	1.84
Beams, open hearth	7	2½	to	7	12½	1.55	to	1.65
Channels, open hearth	7	7½	to	7	17½	1.60	to	1.71
Angles, open hearth	8	2½	to	8	12½	1.76	to	1.86
Ship plates, open hearth	7	12½	to	8	2½	1.66	to	1.76
Black sheets, No. 24 gage	10	5	to	10	10	2.21	to	2.27
Galvanized sheets, No. 24 gage	13	7½	to	13	10	2.89	to	2.92

Continental Prices f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 0.50 to 0.90 per cent phos.	£3	8s.	to	£3	11½s.	$16.49	to	$17.33
Foundry iron, 2.50 to 3.00 per cent sil. 1.00 per cent and more Phos.	3	11				17.21		
Billets, Thomas	4	17	to	4	17½	23.52	to	23.64
Sheet bars, Thomas	4	17	to	4	17½	23.52	to	23.64
Wire rods low C., No. 5 B.W.G.	6	5	to	6	6¼	30.30	to	30.61
Black sheets, No. 31 gage, Japanese	12	10	to	13	0	30.62	to	63.05
Rails, 60 lb. and heavier	6	10*				31.52		
Rails, light	6	1½				29.46		
						Cents per Lb.		
Steel bars, merchant	5	13	to	5	14	1.24	to	1.25
Steel bars, deformed	5	12	to	5	12½	1.21	to	1.22
Beams, Thomas, British standard	5	5	to	5	6	1.13	to	1.15
Channels, Thomas, American sections	5	14	to	5	18	1.25	to	1.27
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	5	6	to	5	6½	1.14	to	1.15
Angles, Thomas, 3-in.	5	13½				1.24		
Ship plates, open-hearth inspected	7	10				1.62		
Hoop and strip steel over 6-in. base	5	16	to	5	18	1.25	to	1.27
Wire, plain, No. 8 gage	7	8½				1.63		
Wire, galvanized, No. 8 gage	9	7½				2.03		
Wire, barbed, 4-pt. No. 12 B.W.G.	11	12½				2.58		
Wire nails, base	7	10½				$1.63	per keg	
Wire nails, assortments, 1 to 6-in. keg	10	6½				2.23		

*Open-hearth steel, 10s. ($2.42) per ton extra.

tons each for Norwegian interests; builders on the Humber River have received orders for three steam trawlers, and Yarrow & Co., Ltd., Glasgow, have secured an order from the Jugoslavian Government for the construction of a powerful flotilla leader. They have also received instructions from the Colombian Government to build three shallow draft gunboats. Generally, however, shipbuilding has not improved, recent orders being inadequate to replace vessels being completed. Orders for new merchant ships are small and the Government's decision to suspend work on its program of naval construction will exercise an important influence on the industry.

Germany Second as User of Machinery

HAMBURG, GERMANY, Aug. 12.—Per capita use of machinery in various countries has recently been investigated by the German Federation of Machinery Manufacturers. The investigation shows that Germany's total investment in machinery in 1924 was only 27 m. ($6.43) per capita, but it increased to 36.20 m. ($8.62) in 1925 and to 47.50 m. ($11.30) per capita in 1928. Although the 1928 figure was in excess of the British per capita use of machinery, it was far less than in the United States.

According to the Federation statistics, the per capita use of machinery in 1925 was 99.40 m. ($23.66) in the United States, 98.50 m. ($23.44) in Canada, 42.80 m. ($10.19) in Australia, 36.20 m. ($8.62) in Germany, 14.50 m. ($3.45) in France, 14.10 m. ($3.36) in South Africa, 13.10 m. ($3.12) in Czechoslavakia, 4.1 m. ($0.96) in Russia, 6. 70 m. ($1.59) in Japan, 0.70 m. ($0.16) in India and 0.20 m. ($0.05) in China.

World figures on per capita use of machinery in 1928 are being compiled by the German Federation of Machinery Manufacturers, but are not yet completed. Preliminary statistics show use at 47.50 m. ($11.30) per capita in Germany, 46.30 m. ($11.02) in Great Britain and 17.90 ($4.26) in France.

South African Manganese Ore Agent Appointed

The Manganese Corporation, Ltd., with headquarters in London and administrative offices in Johannesburg, South Africa, has appointed William H. Muller & Co., 122 East Forty-second Street, New York, agent for the United States in the sale of its manganese ore. The property of the company is in Postmasburg, South Africa, and will be connected with main line railroad early next year, so that sizable shipments are expected to begin in April, 1930. The ore, it is stated, has a minimum of 52 per cent manganese and a maximum of 0.15 per cent phosphorus.

Polish Wages Under Dollar a Day

Workers, However, Receive Coal and Other Allowances—American Capital in Eight Steel Producing Works

IN a report on the steel industry of Poland, W. H. Myer, assistant chief, Iron and Steel Division, Department of Commerce, says in part: "The recent acquisition by American interests of important holdings in some of the major units of the Polish iron and steel industry has focused attention on this situation in Europe and the United States."

Poland's position as a nation producing and exporting iron and steel is outlined. The Polish attitude toward the International Steel Cartel is explained and the agreements with Germany on pipe and scrap are described. At present four large Polish mills are members of the International Tube Cartel. These are the Bismarckhütte, Krolewska and Laura foundries, Bank foundry and the Sosnowiec Pipe Works. The mutual territorial protection afforded to members of the Cartel includes the Polish companies. Polish domestic sales are not limited but export quotas are determined.

Of employment and wages in Poland, the report continues: "The firms making up the membership of the Union of Polish Iron Foundries employed 39,480 workers at the end of January, 1927. The number had increased to 44,716 at the end of December of that year. By the end of December, 1928, employment had risen to 52,753 workers.

"The question of wages has such an important bearing on production costs that it seems worth while to give in some detail the earnings of workers in the Polish industry, as officially stated by the Union of Polish Iron Foundries. The following figures are all for 1927, as the 1928 report is not yet available.

"In the whole Polish industry the average cash daily earnings per worker, including overtime pay, were: In blast furnaces, 8.22 Zloty ($0.925) per day; in steel mills, 8.10 Zloty ($0.911); in rolling mills, 8.81 Zloty ($0.991).

"Workers in the plants in the Kielce and Krakow provinces received less than the above figures, while wages in Polish Upper Silesia were higher than the average for the whole country. These figures are the average for all workers, including skilled and unskilled.

"Some idea of the wages paid to skilled workers may be gained from the following average cash earnings per day: Blast furnaces, firemen, 11.58 Zloty ($1.303); steel works, firemen, 11.69 Zloty ($1.315); rolling mills, skilled operators, 12.66 Zloty ($1.424). The highest average wages were those paid to steel works 'firemen' in Polish Upper Silesia, which were 15.22 Zloty ($1.712) per day.

"In addition to wages paid in cash, it is customary for workers to receive coal allowances and other payments in kind. However, the total value of these additional wages amounted to only 3.1 per cent of cash payments, so that it is not difficult to see that the actual wage scale is low, according to American ideas.

"It is further interesting to note that reductions were made from workers' earnings to the extent of slightly more than 7 per cent of total wages. These deductions were for sickness benefit societies, unemployment fund, workers' common fund, income tax, and certain other statutory deductions.

American Investments

"Within recent months, press announcements have been made concerning substantial investments of American capital in the shares of some of the most important operating companies. These are the Bismarckhütte and the United Krolewska and Laura Foundries. Bismarckhütte operates the Bismarck and the Bethlen Falva works. It also owns all stock of the Katowice Mining & Metal Co. which operates the Marta and Hubertus plants. The Silesia company, also owned by Bismarckhütte, operates the Silesia works. The United Krolewska and Laura Foundries operate the Krolewska, the Laura and the Zgoda works.

"There are thus eight operating plants in which American capital has been invested. The importance of these can be judged by the percentage of total Polish production emanating from them, which is as follows: Pig iron, 39.82 per cent; steel ingots and castings, 50.01 per cent; rolled products, 39.37 per cent; iron and steel pipe, 56.48 per cent."

Russia Plans to Increase Manganese Ore Output

MOSCOW, RUSSIA, Aug. 11.—The Government's five-year plan of industrial development, to be completed by the business year 1932-1933, contemplates considerable expansion in manganese ore production at both the Nikopal and Tchiaturi deposits. It is also planned to erect a blast furnace at the mines at a cost of 25,000,000 rubles, for the production of ferromanganese. An effort will also be made to increase output at both the Nikopol and Tchiaturi mines, production will be centralized and modern equipment installed and the port of Poti, Georgia, on the Black Sea will be modernized.

It is estimated that the output of ore per employee at the mines can be increased 74 per cent by modernization and that production costs can be reduced 35.5 per cent. The program

calls for a production of 2,290,000 tons of manganese ore at Tchiaturi by 1932-1933. It is noteworthy that the combined exports of Tchiaturi and Nikopol in 1913 were 1,193,800 tons, but had declined to 784,600 tons in the business year 1926 to 1927 and to 498,800 tons in 1927 to 1928. The supply at Tchiaturi is 200,000,000 tons of 40 to 50 per cent manganese ore.

Prior to the war these deposits furnished 52 per cent of the world demand for manganese ore, but in 1928 they supplied only 21.4 per cent. Although exports of Tchiaturi ore are considerably smaller than in pre-war years, exports of ore from the Nikopol mines are larger. It was the rapid development of the Nikopol mines that is reported by the Government to have been a factor in the relinquishment of the Harriman concession, which was at Tchiaturi. The entire export of Georgian manganese ore is now controlled by Manganexport, with main sales offices in Berlin, Germany. At present, according to Government engineers, the prices quoted for Russian manganese ore are unremunerative, but losses are accepted so that foreign exchange may be accumulated.

British to Study Design of Steel Structures

LONDON, ENGLAND, Aug. 17.—The Department of Scientific and Industrial Research has completed arrangements for an investigation, to begin in the early autumn, into the application of modern theory of structures to the design of steel structures.

The suggestion to hold the inquiry was made by the British Steelwork Association, a recently formed organization, which comprises practically all British fabricating firms and rollers of structural steel, and has for its objective the promotion of new and extended uses of steel.

The association invited the Department of Scientific and Industrial Research to organize an investigation into the problem, and it offered a financial contribution of £2,000 a year for five years, which will cover about one-half the estimated cost.

To insure the ready acceptance of the results of the investigations, the department has appointed a committee composed of representatives of the association, the Institution of Civil Engineers, and nominees of the department, under the chairmanship of Sir Clement Hindley.

Germany Divides with Saar Reparations Orders

HAMBURG, GERMANY, Aug. 12.—An agreement has been made between the German and Saar steel industries, by which about 10 per cent of all orders for rails, track supplies and steel for bridges to be booked to reparations account will be placed with mills in the Saar. The agreement is effective until 1935.

Would Make Canada Independent in Steel

Ontario Government Prepared to Pay Bounty on Ore—Electric Furnace Reduction Planned

A MOVEMENT to make Canada independent of other countries for its supplies of iron ores was announced on Aug. 24 in Sault Ste. Marie, Ont., by Hon. G. H. Ferguson, prime minister of Ontario. He stated that the provincial Government was prepared to pay a bounty of 1c. a unit, which in the case of the ores concerned is estimated will run from 50c. to 75c. a ton of ore.

Ore consumed in Ontario steel mills is brought from the Lake Superior district mines in the United States. It is stated that the bounty will make it possible to compete favorably with the imported ores, as it will amply cover the increased cost entailed in the use of the Ontario iron ores.

In commenting on the announcement, J. D. Jones, vice-president Algoma Steel Corporation, Sault Ste. Marie, stated at the meeting where the Prime Minister made this announcement:

"There are in Canada immense reserves of iron ores of excellent metallurgical quality, and large tonnages of these are contiguous to the Great Lakes water system. The Lake Superior ores are divided into two classes, siderite and magnetite. The beneficiation of these ores has been successfully accomplished.

"The cost of production of beneficiated ores is, of course, greater than the cost at which the American Lake Superior ores can be laid down on Canadian furnace docks, and, therefore, Government assistance in the way of bounties will be required to establish firmly the Canadian iron ore industry.

"The cost of producing iron ore is largely a matter of sustained tonnage production, and no assistance can be definitely established until Canada's furnaces are put in a position where they can be assured of a reasonable tonnage production. With reasonable tonnage production assured it will be possible to turn our attention to the production of Canadian ores and thereby permit the economical working of our iron ore problem."

Plans to Make Sponge Iron

Robert Turnbull, president Volta Mfg. Co., Welland, Ont., spoke of the development of a new electric furnace, especially adaptable to the reduction of Canadian ores. Mr. Turnbull was formerly associated with Dr. Heroult and assisted in the installation of the first electric steel melting furnaces in the United States.

Mr. Turnbull stated: "Furnaces are now being built and installed in Canada which will produce steel ingots at a cost considerably lower than that of the imported article, and the time is not far distant when Canada will be completely independent of other nations for the steel ingot supply, providing a certain condition is met. That is the substitution, or rather, the adding to the tonnage of the steel scrap supply of some other basic raw material, because as the tonnage of manufactured steel increases, there will not be sufficient steel scrap in the country to meet the demand.

"After considering the matter some time I came to the conclusion, as others, I believe, have done, that there was only one answer to the problem, and that was to develop an economical method for the production of sponge iron, and at the same time use such a process in solving the problem of utilizing Canadian ores exclusively in the manufacture of iron and steel in electric furnaces.

"The cycle of operations in our proposed process for the production of sponge iron is as follows: The ore to be treated is crushed, then mixed with a reducing agent, carbon, and pressed into a briquette of special form. These briquettes are then automatically conveyed to the furnace and charged through a hopper into the preheating chamber, and from there to the first reducing chamber, where a partial reduction of the ores takes place.

"The charge is then passed automatically through the second chamber, where are located the resistors supplying the electric heat. This chamber is kept at a constant temperature by automatic regulation, the reduced iron leaving the furnace automatically. This is again crushed, passed over a magnetic separator where the iron is removed from the gangue, then to a press, where the iron, which is in granular form like fine sand, is pressed into any desirable shape. Then the product is ready for the open-hearth or electric furnace to be melted into steel.

"The entire operation as outlined is automatic, and labor cost should be extremely low. A new furnace is now being completed, and if successful a commercial unit will be built at some point where cheap electric power and iron ore are available."

Diesel Engine Driven Plane Flies 15 Hours

HAMBURG, GERMANY, Aug. 12.—The German aircraft builder Junkerswerke at Dessau has improved its Diesel engine for airplanes so that in a recent test an airplane equipped with a Diesel engine remained in the air for 15 hr. It is believed that the German commercial air service will equip some planes with Diesel engines in an effort to reduce operating costs.

This Issue in Brief

Heat treating is an art of the highest order. In formulating a new process, the heat treater can trust best his own experience. He cannot, without reserve, use the experience of others. Rate of cooling is a vital factor in heat treating and X-ray is a decided aid.—Page 513.

* * *

Successive steps in machining the crankcase of the nine-cylinder Wright Whirlwind engine include multiple operations, which are performed simultaneously or in sequence. In one case, 20 flange holes are drilled simultaneously on a multiple drill.—Page 525.

* * *

Aluminum alloys can be heat treated to yield a wide range of properties. The tensile strength obtainable in some alloys by heat treatment is remarkable. This also applies to ductility and hardness. Heat treating department is now a necessary adjunct to the modern aluminum alloy foundry.—Page 515.

* * *

Substantial savings in weight and improvement in strength and safety of aircraft result from using delicately constructed steel alloy parts heat treated by a new process. Parts are handled without distortion in large electric furnaces. Cost of heat treating has been reduced by establishing centrally-located plant for the industry, where work may be done on a production basis.—Page 519.

* * *

Products and personnel of 250 exhibitors indicate in part the commercial and technical promise of the metal exposition in Cleveland in the week of Sept. 9. —Page 529.

Exports of iron and steel products in first seven months of 1929 were the largest for any corresponding period since 1921. In rolled and finished steel, the gain over 1928 was 19 per cent.—Page 583.

* * *

American output of alloy steels in 1928 exceeded 3,000,000 gross tons for the first time. Expansion in production of electric alloy steel castings has been rapid.—Page 544.

* * *

Sixteen vertical core ovens, 45 ft. high, save much space in comparison with the horizontal type in Michigan automobile foundry. Each core-maker loads his own cores on furnace trays. This eliminates the use of racks and the necessity for aisles.—Page 549.

* * *

Remedies for crystal spots on plated ware, especially builders' hardware, are the exclusion of sulphur from the surroundings, the use of lacquers which retard spotting, application of a thin film of grease to the lacquered surface and the use of wax paper for wrapping.—Page 516.

* * *

United States Navy uses standard colors to mark ends of bars, billets and other metals for identification. This system probably will be adopted by all departments of the Government.—Page 518.

* * *

Machinery exports in July were the second highest ever recorded. The total for the first seven months of the year reached a new high level for that period, amounting to more than $362,000,000.—Page 585.

Long structure - weakening flakes of graphite found in ordinary cast iron can apparently be induced to take more globular and less damaging forms. Although this has been done by the malleabilizing process, heat treatment by other and quicker methods gives promise of usefulness.—Page 517.

* * *

Diameter of single (upper) roll used in bending steel plates is 1.136 times that of each of the two lower rolls. Stresses induced in the rolls are a function of the thickness and the width of the plate being bent. Critical conditions are found when the width reaches 79 times the thickness and again at 109 times the thickness.—Page 546.

* * *

Progress in case carburizing, as seen by the testing engineer, has been mainly along the lines of improved technique and in the development of gas carburizing. Since there is no need for expensive and frequently-renewed carburizing boxes in gas carburizing, this field is especially tempting for further study.—Page 517.

* * *

Metal construction is lighter than wood for aircraft parts where the design is such that the full strength of the metal is taken advantage of. Wood is virtually obsolete as a structural material for aircraft.—Page 519.

* * *

Trend toward a fairly general agreement as to principles of heat treating and the development of the nitriding process for hardening steel surfaces are outstanding features of steel treating in the past year, states authority.—Page 517.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

Is There Inflation?

WRITING in the current bulletin of his company, Col. Leonard P. Ayres, vice-president of the Cleveland Trust Co., points out that up to the end of 1928 stock prices had risen to 55 per cent above normal, and so far in 1929 they have continued up until they are now about 76 per cent above normal. He proceeds to explain that "the generally vigorous and persistent advance in the earnings of the leading industrial corporations during the last five years probably constitutes the most important single cause behind this unprecedented advance in stock prices. Investors are buying stocks, instead of bonds and mortgages, because they realize that, if corporate earnings continue to advance, the yields will eventually become adequate."

Colonel Ayres's explanation is sound in so far as it goes, but manifestly it does not go far enough. For one thing we need to understand better the reason for the advance in corporate earnings. Anyway, we shall feel considerably more comfortable if we understand it.

In the first place we have had a steady increase in population and have made no economic mistakes leading to extensive unemployment. In other words, an increasing number of workers has been working as nearly to full time as seasonal conditions and their own wishes permit, and at the same time their number has been swelled in effect by greater mechanization and improved organization. The earnings of the railroads and other public services were bound to be increased by such conditions if by nothing else.

At the same time numerous corporations have been engaged in doing new things. There have been phenomenal developments in the chemical industry, in the production of rayon, and in the conquest of the air. Also the public appetite for amusement has led to great earnings by the purveyors to that demand in radio-telephony, in theatrical shows, and most lately in the phono-cinema. The interest in automobiling has waxed, not waned, and the earnings originating through it spread to the production of iron and steel, petroleum, copper, cement, and so on. On the other hand there have been some reverses. The fertilizer manufacturing concerns have not done well. The desire of the women of the world to wear their skirts supra-knee high has played mischief with the textile industry except in its rayon branch, which has supplied the girls with the material for their stockings and underwear.

At the present time we have right before us the development of a new group of copper deposits in Rhodesia that give sound promise of proving to be the greatest occurrence of copper the world has known. By the time their copper is ready to come on the market it will be needed for more telephone, light and power lines, more electrical machinery, etc. It is entirely reasonable that the stocks of those companies should be bid up even if they are making no present return and indeed are absorbing capital and credit for their equipment.

All of this fails, however, to explain the rapidity and violence of the rise in corporate securities, running to 76 per cent in the space of two or three years and bringing the grand total of quotational value up to something in excess of 200 billion dollars, according to one estimate. Any such figure is to be viewed with reservation, for among other things there are duplications from one listed company's ownership of stock in others. Nevertheless, we may easily accept that the aggregate of the quotational value of corporate shares, listed and unlisted, eliminating all duplication, has attained an enormous total and one that is out of all reasonable proportion to our national wealth if computed on the basis of 1913 prices. Heretofore we have suggested that our national wealth if uniformly written up would be far in excess of what the Census and other authorities have estimated.

Now, the probability is that this is just the process that has been lately going on. We had previously written up our real estate and some other things, but had not done so with our railroads and mines and many of our factories. The process that has been going on has been characterized by some financiers as inflation. It creates, indeed, an expanded basis for credit and such use has been made of it, to the despair of the Federal Reserve Board. However, it is certainly not a general inflation, but rather it is in the way of being an equalization in inflation. We have been inflated to about 160 per cent in our general index of price level. We have been bringing our national capitalization up to the same figure or something like it.

So we will answer our captional interrogation in the affirmative, and will agree that we are having inflation, but so have we been ever since the index of general price level began to rise sharply, about 1916. However, we are certainly not experiencing any currency inflation or anything that has to do with the quantitative theory of money. Nor are we overproducing commodities and building up accumulations in which credit is being frozen. And somehow we fail to become alarmed about the inflation that has been blossoming in the stock market.

Heat Treatment as a Science

FOR many years the old-fashioned tool maker has been able, and still is, to bestow a fine cutting edge of long life on a rough piece of steel. His eye and experience tell him just when the tool has reached the proper heat for forging and quenching. He knows not the reasons why. Similarly the blacksmith fashions out of a crude piece of metal a hard, serviceable product. Science is not recognizable in these accomplishments.

The last fifteen years have been a marvel of progress in the heat treatment of metals. Expansion of the steel treaters' organization from a small beginning to a great technical society in eleven years is impressive witness to the fact. In this issue of THE IRON AGE, which especially emphasizes this progress, one writer observes that not yet have operations in this field been brought under scientific control. Too many uncertainties remain to be cleared up. Yet each year records progress in organizing our knowledge.

A leading testing engineer, whose researches in fatigue of metals are known internationally, points out on another page that lately general agreement has been reached as to the principles of heat treatment, also that advances in gray iron are signal. Another writer, who has specialized in aluminum alloys, tells of their rapidly growing uses, under heat treatment. They promise soon to figure in the construction of street railroad cars, steam railroad passenger cars and parts of locomotives, as they are already doing in the building of aircraft, motor cars, trucks and buses—such is the modern demand for saving in weight and increase in speed.

We need not doubt that heat treatment will yet be known as a science in the full three-fold sense of exact knowledge of facts, exact knowledge of laws, and exact knowledge of proximate causes. But, as is indicated on the first reading page of this issue, that goal is some distance ahead.

Automotive Industry's Earnings

TWO years ago General Motors attracted much attention by having earnings in the first half of the year 42 per cent in excess of Steel Corporation earnings. In the first half of this year there was only 15 per cent excess. Yet the automobile industry has been extremely active, even more so than the steel industry. *Automotive Industries* compiles a comparison of earnings of ten representative passenger car companies, showing first-half earnings totaling $203,732,321 for last year and $206,586,527 for this year, making only 1.4 per cent increase. General Motors, representing about three-fourths of the total, decreased 6 per cent. Peerless had an increased loss, Pierce-Arrow converted a loss into a very substantial profit, and some others had large decreases in earnings.

Large earnings in the first half of 1927 were not difficult to understand. Total production was only 11½ per cent under the record first half and as Ford production disappeared entirely before the end of the half year, non-Ford production had a large increase.

The small gain this year over last in automobile industry earnings, when activity has been so great and when nearly all other industries have shown large gains, affords food for thought, there being basis for making some plausible guesses.

The most interesting comparison is between steel and automobiles. The steel companies have had a larger increase in earnings than in tonnage, there being a substantial increase in earnings per ton, yet without any really material increase in realized prices. The explanation is that with full operation the extra tonnage produced cost less per ton, general running expenses not increasing in anything like the same proportion as tonnage.

It was not thus with the automobile industry, whose profits per car evidently decreased. On account of changes in models and specifications direct comparison of costs and list prices cannot be made, but it is not difficult to form a conception of the general merchandizing situation in the industry. At the opening of this year capacity was far in excess of any previous production and clearly it was a case of finding out who would survive. For eventual success a large turnover was absolutely essential. Any car that went down in sales would lose ground, no matter how much profit there were per car, because the public would lose interest.

The automobile industry knew that it was entering a year of intense competition, in all probability a crucial year for not a few of the individual producers. There has been intensive sales effort. While the steel industry sold its extra tonnage this year at practically no additional expense—and its selling expense is always relatively low—the automobile industry, it being understood that Ford is not included in this discussion at all, went to much expense to sell its extra quantity. It is a detail whether the extra expense was in pricing cars low relative to cost or in extra selling expense, including advertising, unusual commissions and other special allowances. While the public no doubt has been really anxious to buy automobiles it has been given a great deal of expensive encouragement.

Here, then, is the great difference between steel and automobiles. An additional tonnage of steel has been sold at almost no expense, while an additional number of automobiles has been sold at a very high expense. Nobody is particularly to blame; the circumstances were simply laid out by the march of events.

More Pig Iron to Steel in Europe

LAST year the steel ingots and castings produced in the United States weighed 35.1 per cent more than the pig iron produced. For Europe, including the United Kingdom, the excess was only about 17.4 per cent. There is quite a difference. Why? As the United States is a relatively new country one would rather expect the divergence to be in the other direction.

It is necessary to get clearly in mind in the first place that the apparent excess of steel over pig iron is not a real excess. The major part of the scrap used in any steel works is the scrap the works produces itself in converting steel ingots into merchantable material. Last year the United States produced 50,325,393 tons of steel ingots, but only 37,177,939 tons

of rolled steel, the difference being chiefly works scrap; and through conversion of skelp into pipe, rods into wire, etc., the merchantable material as shipped was less than the rolled steel. The production of pig iron and ferroalloys was 38,155,714 tons, showing a slight excess over the merchantable steel. That excess, plus the pig iron used in making iron and steel castings was, in a rough way, the measure of the outside scrap, whether old material or industrial scrap, used by the steel works.

We cannot assume that European makers crop their ingots less by reason of making better ingots than we do. In the present consideration practice must be taken as much the same here and abroad. We cannot study the different countries in detail, because much pig iron moves from one country to another. Poland made more than twice as much steel as pig iron and Italy three and a half times as much, but that was due to importing pig iron. Both France and Luxemburg made only 93 per cent as much steel as pig iron, which was due to exporting pig iron.

The question will naturally arise, whether these much older countries, long producers, are originating more old material than we are. Assuming, for illustration, that material comes back as scrap a quarter century after it is made, we were making 25 years ago only half as much pig iron, while Europe was making fully four-fifths as much as at the present time. It might be concluded that the relative outcome of old material should therefore be greater in Europe than in the United States.

We can be sure, however, that this is not the case. Europeans have not gone in so much as we for steel structures and other things that can be wrecked in time and the material reclaimed, nor if they did would they abandon the things so soon for bigger things. The per capita consumption being smaller, the material is more widely dissipated.

In addition to this consideration, we may be reasonably certain that Europe as a whole puts a larger proportion of its pig iron into iron castings than we do. It is a notable fact that our production of iron castings has not grown in the last 20 years. Precise statistics would probably show a decrease. One can only estimate by observing that the production of pig iron for foundry work has not increased, while the proportion of scrap used in foundries has probably decreased.

These two considerations fit into one general conclusion, that the United States, although new, has progressed beyond Europe, replacing its steel after shorter periods of service, and using on a larger scale rolled steel and forgings in preference to iron castings.

Bolts, Bearings and Profits

BEARINGS and bolts are relatively inconspicuous machine elements and they get less attention from the designer and constructor than moving parts like cranks, gears and shafting, or shock-resisting details like springs or cutting tools. Yet they are of major importance in operation, as many a maintenance man can testify. In this age when machinery does everything that can be done without human labor, the machine owner makes money only when the machine runs. And it runs on bearings and is held together by bolts. Operators therefore call down blessings on the man who provided generous bearings and ample lubrication to the journals, and properly objurgate the unknown designer who skimped material in studs, bolts and rivets.

Everyone knows that there have been important advances in the methods of lubrication. We see fewer greasy mechanics with long-spout oilers, sprinkling oozy liquid on everything surrounding the elusive oil hole. Much complicated machinery has an oil circulating system built into it, supplying every rubbing surface with a generous and constant supply of cool, filtered oil. In other equipment the oil-can nuisance has been scotched by grease cups or by periodically forcing into the bearings grease under pressure. The use of high-grade roller and ball bearings and a better knowledge of the manufacture and properties of bearing bronzes and other alloys have also improved the operating efficiency of much machinery.

As a notable case in point we have in mind one entire rolling mill which is equipped with a force-feed system of lubrication reaching every bearing—on motors, drive, roll housings, tables, manipulators and all auxiliaries. Oil is circulated, cooled, filtered and reused. Oil supply is so interlocked with main control circuits that if the circulation should be interrupted for any cause the entire mill closes down. The excellence of this system is such that make-up oil amounts to about 30 cents a day, or as much as one oiler might waste in an hour.

But the greatest profit from such a well designed system comes from the fact that the machinery is always ready to operate. Generous design in all parts, and especially in bearings and bolts, enabled this same mill to operate throughout 1928 with total delays chargeable to failures in equipment amounting to 19 minutes. It is not a brand new mill, either—just built right and maintained right. Ability to run when wanted is the ideal.

Another citation: This ability to run when wanted is one of the greatest advantages of the oil-electric locomotive. One sizable steel plant requiring five steam locomotives for switching service has been able to replace them with four oil-electrics, because the old equipment was down such a large percentage of the time for cleaning boilers, fires and grates, for loading coal or water, or for repairs and inspection. Of course, the oil-electrics do not operate 100 per cent of the time; they must load oil and also undergo inspection and repairs. But the general quality of material, workmanship and design in the newer equipment is so much better than in the old that such delays are hardly 5 per cent of the time. To say nothing of the smoke nuisance and fire hazard, such an "ability to serve" means much in reducing repair gangs, auxiliary repair equipment and even in some instances operating labor.

These instances are cited to substantiate the original proposition that machines make money only when they operate, that they operate on bearings and are tied together with bolts, and that money spent in generous proportions and intelligent design will pay good dividends in operating economies. And these propositions hold for entire establishments as well as individual machines.

CORRESPONDENCE

American Costs of Concentrating Manganese Ores

To the Editor: Referring to your discussion (THE IRON AGE, Aug. 8) of the Bradley manganese leaching process:

You comment on the ammonia leaching process of Mr. Benedict of the Calumet & Hecla; but it is not necessary to do much guessing as to the cost of that process. The company gives the cost of the copper recovered as around 7c. per lb.; and if the recovery is 12 lb. per ton of sand, that means an operating cost of 84c. a ton, which includes smelting the precipitate to refined copper.

The Bradley process is the type of process adapted to American production, the basic law being that means must be devised that do away with hand labor. It makes no difference how complicated a process may be (if it succeeds in its object) if the labor cost is low, and the labor costs in such processes as this are low. That is the whole story.

The great successes in American mining today are in those cases where there is a large tonnage that can be extracted cheaply and then subjected to concentrating processes. The matter of grade of ore is nothing or next to nothing, if there is plenty of it and if modern technology is applied, with low labor cost.

If there is a duty, where the Bradley process and other processes will meet their trials is in competition with natural deposits of good grades of manganese ore here. There are those who assume to know so much of creation that they know there is practically no manganese ore in the United States. This is highly absurd. Nobody knows anything about the actual resources of manganese in the United States. It is known, however, from a great number of researches that the chemical composition of the continents of the earth is much the same, as anybody can ascertain by referring to the reports of exhaustive researches given by Dr. F. W. Clarke of the U. S. Geological Survey in Bulletin 770, "The Data of Geochemistry."

It is also well known by competent geologists that the supposed ore-forming processes have been much the same in the different continents and it is a fair and safe conclusion that the United States has its share of both high-grade and low-grade manganese ores. What the United States lacks, when it comes to producing tin and tungsten, manganese and chrome, and most minerals, is labor at 10 cents a day and 25 cents a day. There are probably 500 known manganese ore deposits in the Appalachian ranges alone that could be immediately operated at a good profit if there were a supply of cheap coolie labor to dig the dirt and pick out the lumps of manganese.

Any analogies in the consideration of manganese which it is attempted to apply to American production and Indian production are entirely unsafe. Methods of production must be adapted to conditions and these are highly variable. When a native population in Africa, estimated at 200,000,000, with access to natural resources on a grander scale than in this country, has been put into action, larger interests than those in manganese—such as iron, steel, copper, corn and cotton—will find out something about paying $4 a day for labor and trying to compete with 10-cent labor.

ANSON G. BETTS.

West Cummington, Mass., Aug. 15.

Republic to Acquire Union Drawn Steel Co.

CLEVELAND, Aug. 27.—The Republic Iron & Steel Co., Youngstown, and the Union Drawn Steel Co., Beaver Falls, Pa., have agreed upon terms by which the Union Drawn company is to be acquired by the Republic organization, according to a statement by Cleveland financial interests who have been negotiating the deal. The Union Drawn company, which is the largest independent maker of cold drawn steel products in the country, operates three plants at Beaver Falls and one each at Gary, Ind., Hartford, Conn., Massillon, Ohio, and Hamilton, Ont.

Terms of the proposed sale have not been made public and will be subject to approval of stockholders of Union Drawn company.

Low Expansion Alloy for Gas Engine Pistons

A new alloy, developed by Aluminum Co. of America is being used by Reo Motor Car Co. for pistons. Reo engineers think it is better than the former plain skirt aluminum piston, which has been so successful in the past. The new material is called Low-Ex and has a thermal expansion rate 12 to 15 per cent less than that of previously used alloys, while the heat conductivity is 15 to 20 per cent greater. As a result, piston clearance is reduced 0.003 in., which means longer piston life due to greater wearing margin.

Whitcomb Company to Make Oil Electric Engines

The George D. Whitcomb Co., manufacturer of industrial and railroad locomotives, has broken ground for the construction of a new factory unit. The expansion is for oil-electric locomotives from 20 to 100 tons.

Program for Iron and Steel Institute's Fall Meeting

The autumn meeting of the (British) Iron and Steel Institute will be held at Newcastle-upon-Tyne, England, in the Festival Hall of the North-East Coast Exhibition, Sept. 10 to 12. The following is the list of the technical papers scheduled:

"Notes on Wire for Mining Ropes," by A. T. Adam.

"The Solubility of Carbide in Ferrite," by H. A. Dickie.

"Electrical Conductivity of Magnesite and Some Other Refractory Materials in Relation to the Temperature and Their Other Properties," by E. Diepschlag and F. Wulfestieg.

"Notes on the Damping-Down and Re-Starting of Blast Furnaces," by C. S. Gill.

"The Hardening of Superhardened Steel by Magnetism—The Lattice Resonance Hypothesis," by E. G. Herbert.

"Crystallization and Segregation Phenomena in 1.10-Per Cent Carbon Steel Ingots of Smaller Sizes," by A. Hultgren.

"High Elastic Limit Structural Steels," by J. A. Jones.

"The Hardness of Vacuum-Annealed Crystals of Iron," by H. O'Neill.

"Iron in Antiquity," by T. A. Rickard.

"The Correlation of Fatigue and Overstress," by J. H. Smith, C. A. Connor and F. H. Armstrong.

"The Coalescence of Pearlite," by J. H. Whiteley.

"Iron-Silicon-Carbon Alloys—Constitutional Diagrams and Magnetic Properties," by T. D. Yensen.

Bar Mill Rate Unchanged

For September-October, tonnage rates for boilers and finishers in mid-western mills continue without change from the July-August rate. At the bi-monthly examination of sales sheets, the average selling price of bar iron shipped during the 60 days ended Aug. 20 was disclosed as 2c. a lb., or unchanged from the previous settlement.

Grefco chrome high temperature cement and Standard silica bonding cement, products of the General Refractories Co., Philadelphia, are now being sold through dealers.

Iron and Steel Markets

Output Reduced in Some Products

Rollings of Rails, Tin Plate, Bars and Strip Steel Lower— Ingot Production of Leading Companies Still High— Large Sales of Southern Pig Iron

REDUCED mill operations in rails, tin plate, merchant and alloy steel bars and strip steel are offset to some extent by continued large output of other products, notably plates, structural material and sheets.

The larger producers, including the Steel Corporation and at least two of the leading independents, having diversified lines, are still maintaining ingot output at 90 to 95 per cent of capacity, while some of the smaller companies average about 85 per cent.

New business and specifications for nearly all steel products except plates and sheets have been in smaller volume than shipments this month, resulting in a reduction in backlogs and shortening of deliveries.

The lull in demand is regarded as merely the seasonal expectation that has come much later in the year than usual. The decline in the requirements of the automobile industry is partly responsible, although other factors are at work, such as a setback in farm implement manufacturing.

Ingot production this month should show a slight loss from that of July. Last year the low point came in June, with each succeeding month bringing an increase up to the last two of the year. Indications point to the present volume of ingot output holding fairly well for another month, by which time the trend of fall business will have become apparent.

Prospects as to the extent of the possible recovery in automobile manufacturing and revival of railroad car buying are still in doubt. A fall buying movement in rails and tin plate is regarded as certain to revive declining rollings of those items.

Automobile output in August will be slightly larger than in July, which was the low month since February, but steel orders from the motor car builders have increased very slowly. Ford production this month is expected to reach 200,000 units, but Chevrolet's schedule is well below its recent peak. Other motor car companies, some of which had sharply reduced their August programs, are expected to manufacture on a greater scale next month.

Demand for sheets has held up surprisingly well in spite of the decline in automobile demand. Orders this month have been almost equal to shipments. At the beginning of August independent mills had unfilled orders for a month and a half, while the leading interest has two months' bookings and is again operating this week just under 100 per cent.

This is an in-between season for rails and tin plate and both have had sharp curtailment in rollings. The rail buying movement is expected to get started earlier than usual this year, and 20,000 tons is already mentioned as a possible purchase before Sept. 15 for fall delivery. Meanwhile, some rail mills have reached the end of their obligations. This is true of one at Chicago, though the other there has a 75 per cent schedule arranged into October, while the Ensley mill of the Tennessee Coal, Iron & Railroad Co. has been shut down, together with four open-hearth furnaces which were supplying it with steel.

Tin plate operations have declined to an average of 80 per cent or less. Though the leading producer is at better than 85 per cent, output of independent mills ranges from 50 to 75 per cent. Within a month, however, mills will begin rolling on next year's business.

Structural steel demand during August has been heavy, on top of a seven months' total which exceeded that for the same period last year by 16 per cent. Although the week's awards dropped to 22,000 tons from more than 50,000 tons in the preceding week, fresh inquiries totaled 58,000 tons, of which 27,000 tons is for bridges, one at Cleveland calling for 15,000 tons.

Plate mills are still operating at close to capacity. Plates are the only steel product in which deliveries have not been materially cut down. Among new requirements is 30,000 tons for four ships.

Railroad equipment orders, totaling nearly 1800 cars, of which 1393 are for the Lackawanna road, were the largest in any week since June.

Steel prices are holding remarkably well despite lessened demand. The fact that a fourth-quarter contract for black sheets has been made at the present quotation of 2.85c. a lb., Pittsburgh, points to a continuance of current prices to the end of the year, notwithstanding talk of an advance.

Heavy sales of Southern pig iron have placed producers in that district in a somewhat more favorable position. One company, which has sold upward of 50,000 tons in the North in the week, has withdrawn from the market, and the others show a tendency to stiffen their quotations, although much of the week's business was taken at prices ranging from $12 to $13.50, Birmingham. Sales included 20,000 tons to two Delaware River cast iron pipe makers, 10,000 tons of basic to an Illinois steel company and 10,000 tons of foundry iron to other Chicago district consumers.

Northern iron remains fairly steady in the face of the Southern competition, though prices have given way 50c. a ton at St. Louis, and Buffalo iron is lower in New England.

THE IRON AGE pig iron composite price has dropped to $18.25 a gross ton, the year's low, from $18.42 last week. Finished steel remains at 2.398c. a lb. for the third week.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Aug. 27, 1929	Aug. 20, 1929	July 30, 1929	Aug. 28, 1928
No. 2 foundry, Philadelphia	$21.26	$21.26	$21.26	$20.26
No. 2, Valley furnace	18.50	18.50	18.50	16.50
No. 2 Southern, Cin'ti	*17.19*	17.69	17.69	19.94
No. 2, Birmingham	14.50	14.50	14.50	16.25
No. 2 foundry, Chicago*	20.00	20.00	20.00	18.00
Basic, del'd eastern Pa.	19.75	19.75	20.00	19.00
Basic, Valley furnace	18.50	18.50	18.50	16.00
Valley Bessemer, del'd P'gh.	20.76	20.76	20.76	18.76
Malleable, Chicago*	20.00	20.00	20.00	18.00
Malleable, Valley	19.00	19.00	19.00	17.00
Gray forge, Pittsburgh	19.76	19.76	19.76	18.01
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	105.00	105.00	105.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	35.00	35.00	35.00	32.00
Sheet bars, Pittsburgh	35.00	35.00	35.00	32.00
Slabs, Pittsburgh	35.00	35.00	35.00	32.00
Forging billets, Pittsburgh	40.00	40.00	40.00	38.00
Wire rods, Pittsburgh	42.00	42.00	42.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.85	1.85	1.85	1.90
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.95	1.95	1.95	1.90
Bars, Chicago	2.05	2.05	2.05	2.00
Bars, Cleveland	1.95	1.95	1.95	1.85
Bars, New York	2.29	2.29	2.29	2.24
Tank plates, Pittsburgh	1.95	1.95	1.95	1.90
Tank plates, Chicago	2.05	2.05	2.05	2.00
Tank plates, New York	2.22½	2.22½	2.22½	2.17½
Structural shapes, Pittsburgh	1.95	1.95	1.95	1.90
Structural shapes, Chicago	2.05	2.05	2.05	2.00
Structural shapes, New York	2.19½	2.19½	2.19½	2.14½
Cold-finished bars, Pittsburgh	2.30	2.30	2.30	2.10
Hot-rolled strips, Pittsburgh	1.90	1.90	1.90	1.75
Cold-rolled strips, Pittsburgh	2.75	2.75	2.75	2.65

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel,	Aug. 27, 1929	Aug. 20, 1929	July 30, 1929	Aug. 28, 1928
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.85	2.85	2.85	2.65
Sheet, black, No. 24, Chicago dist. mill	2.95	2.95	3.05	2.75
Sheets, galv., No. 24, P'gh	3.50	3.50	3.60	3.40
Sheets, galv., No. 24, Chicago dist. mill	3.60	3.60	3.80	3.60
Sheets, blue, No. 13, P'gh	2.35	2.35	2.35	2.10
Sheets, blue, No. 13, Chicago dist. mill	2.45	2.45	2.45	2.20
Wire nails, Pittsburgh	2.55	2.55	2.60	2.55
Wire nails, Chicago dist. mill	2.60	2.60	2.65	2.60
Plain wire, Pittsburgh	2.40	2.40	2.50	2.40
Plain wire, Chicago dist. mill	2.45	2.45	2.55	2.45
Barbed wire, galv., P'gh	3.20	3.20	3.30	3.20
Barbed wire, galv., Chicago dist. mill	3.30	3.30	3.35	3.25
Tin plate, 100 lb. box, P'gh	$5.35	$5.35	$5.35	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$19.00	$19.00	$18.75	$16.00
Heavy melting steel, Phila	16.50	16.50	16.50	13.00
Heavy melting steel, Ch'go	15.25	15.25	14.75	12.75
Carwheels, Chicago	14.00	14.00	14.00	12.75
Carwheels, Philadelphia	16.50	16.50	16.50	15.50
No. 1 cast, Pittsburgh	15.50	15.50	15.50	14.75
No. 1 cast, Philadelphia	16.50	16.50	16.50	15.50
No. 1 cast, Ch'go (net ton)	14.50	14.50	14.50	14.25
No. 1 RR. wrot., Phila	16.00	16.00	16.00	13.50
No. 1 RR. wrot., Ch'go (net)	14.00	14.00	13.50	11.25
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt	$2.65	$2.75	$2.75	$2.75
Foundry coke, prompt	3.75	3.75	3.75	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	14.75
Electrolytic copper, refinery	17.75	17.75	17.75	14.50
Tin (Straits), New York	*46.12½*	46.50	47.25	47.50
Zinc, East St. Louis	6.80	6.80	6.80	6.25
Zinc, New York	7.15	7.15	7.15	6.60
Lead, St. Louis	6.55	6.55	6.55	6.22½
Lead, New York	6.75	6.75	6.75	6.40
Antimony (Asiatic), N. Y.	9.00	9.00	8.62½	10.25

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Industry Marking Time to Discover Trend of Demand, Meanwhile Operating Close to 95 Per Cent

PITTSBURGH, Aug. 27.—The steel industry in the Pittsburgh and tributary producing districts is marking time and it will be another month before the trend for the fourth quarter will be clearly discernible. New business and shipping orders on all products except plates and some finishes of sheets are far from sufficient to sustain present operating schedules and backlogs are already considerably reduced in some lines.

Nevertheless, the Steel Corporation subsidiaries and the leading independent producer in the immediate Pittsburgh district are still able to utilize capacity ingot output in their various finishing departments and have not yet begun to accumulate raw steel to any marked extent for their reserve stocks. For this reason it will be another month before any decided curtailment in the rate of steel making will be necessary and present operations, which are still not far below 95 per cent of the theoretical top, are not expected to decline immediately. And during that month improved demand from leading consuming industries may change this decline into an increase.

The present lull in demand is entirely natural and not alarming in its proportions. Fortunately, it finds the leading companies so well supplied with old business that new tonnage is not immediately necessary to sustain activity. However, rollings against old rail contracts have now been largely completed and it will be several weeks until new orders are placed.

The same is true with regard to tin plate, specifications for which have receded sharply this month. Leading independent makers of tin plate have reduced their operations to an average of not more than 65 per cent of capacity, although the Steel Corporation subsidiary is still above 85 per cent.

The decline in demand from the automotive industry has affected steel most seriously. Only one or two of the large makers of automobiles have begun to specify steel for new models and others, particularly manufacturers of cars in the low priced field, have practically withdrawn from the consuming market. The Ford company is the one exception. Its requirements are as large as ever.

This curtailment has forced makers of strip steel, who have been operating on a hand-to-mouth basis for some time, to slow down their mills, with prospects of even lighter schedules before demand again develops. Sheet makers, however, who are favored with unusually heavy commitments, report a sustained demand from other consuming industries and still have sufficient shipping orders for several weeks' work.

Prices are holding remarkably well despite declining demand, and no further weakness has developed during the last week. Galvanized sheets are still soft, but leading independents are taking a firmer price stand and there is talk of an advance in quotations. At least one fourth quarter contract for black sheets has been closed at 2.85c., Pittsburgh.

The pig iron and scrap markets are

quiet. A few small fourth quarter pig iron inquiries are coming out, but buying is confined to small spot tonnages. Heavy melting steel is not quotably weaker, although there has been no buying to give it strength.

Pig Iron.—Fourth-quarter inquiries are beginning to reach the trade, although no sizable tonnages are reported. Spot sales are being made regularly and leading sellers believe that foundries in the district will have their stocks and contract tonnages completely used up by the end of the next month. Consequently heavy fourth-quarter buying is expected, particularly if conditions throughout the industry are sustained at recent levels. The firmness of the price is regarded very favorably by both the producers and consumers of iron, as the uncertainty of the market in recent summers has been disturbing to both. Southern iron is rather effectively barred from this territory by freight rates, although existing levels permit competition to a few points not ordinarily serviced by Valley furnaces. However, furnaces in that district have lost no business to Birmingham producers. Present quotations of $18.50, Valley, on foundry and basic iron and $19 on malleable and Bessemer are likely to be retained in the fourth quarter.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—The smaller integrated steel companies in this and nearby districts are now beginning to replenish their stocks of semi-finished steel which were badly depleted during the spring. These same companies have also curtailed their steel production and, as a group, are not operating at more than 85 per cent of capacity. However, the Steel Corporation subsidiaries and the largest independent producers are still finding use for capacity output in their various finishing departments and are running their open-hearth furnaces and blooming and billet mills at close to theoretical capacity. Careful allocation of tonnage leaves little surplus for accumulation. Open-market transactions in billets, slabs and sheet bars are uncommon and the price on small tonnages of all three products seems definitely established at $35 a ton, Pittsburgh or Youngstown. It is conceded that considerable billet and slab contract tonnage is moving at lower figures and fourth quarter prices are a matter of conjecture. Wire rods are firm at $42, Pittsburgh and Cleveland, and shipments are holding up well for this time of the year.

Bars, Shapes and Plates.—The well sustained demand for the heavy hot-rolled products has long since ceased to be a surprise to the industry, and local offices find nothing unusual in the limited curtailment which is occurring at this time in bars and shapes. During the greater part of the year demand has been well diversified and now the only falling off in bars has been from mills serving the automobile industry. During August backlogs on bars and shapes have been drawn on to a certain extent, but at present it is difficult to get shipments in less than two or three weeks. On reinforcing bars the time must be extended to four weeks. Fabricating shops in the district are well engaged, but will again be in need of business by the end of the quarter. Present inquiry indicates that such business will be forthcoming. During the week the Pittsburgh and West Virginia Railroad took 2100 tons of shapes for viaducts on its Connellsville extension. Plate demand seems to be as strong as ever. This district is still feeling the pressure for deliveries in the Chicago area and, although little business from that territory has actually been placed with nearby mills, they have greatly extended their normal Western territory in many instances. Requirements from barge builders are heavy, and present orders on the books of these companies will keep them busy until November. The same cannot be said of railroad car builders, who will need orders by the end of the quarter if their shops are to be kept busy.

Rails and Track Supplies.—This market is very quiet, and it will be several weeks before any improvement in demand can be looked for. The Atlantic Coast Line is inquiring for 10,000 kegs of railroad spikes, but otherwise sizable inquiries for accessories are lacking.

Bolts, Nuts and Rivets.—This industry is operating at 75 per cent of capacity, although there is a growing tendency toward curtailment. Jobber demand has held up well during the summer and heavy shipments are going to fabricating shops, the barge builders and to makers of railroad equipments. The railroads themselves have also been good buyers, but demand from this source has declined seasonably in recent weeks. Prices are generally well maintained.

Wire Products.—August business in manufacturers' wire is going to show a decided improvement over the same month last year and will be ahead of the month just passed with one maker. However, specifications from jobbers are off and business has not been improved by price weakness on products going to that trade. Fencing and wire nails are quiet, with prices apparently checked at recently quoted levels.

Tubular Goods.—Steady demand for seamless and lap-weld tubing is fully sufficient to sustain operations at a rate unchanged from last week, or approximately 65 per cent of full theoretical capacity. Some makers notice a slight improvement in the movement of oil country products in the last few days, but this may be only temporary. Shipments of butt-weld pipe are rather light, but higher building operations in some parts of the country are expected to lead to a stronger demand. Specifications for mechanical and boiler tubing have been declining this month and the tendency has not yet been checked.

Sheets.—The sheet business is holding its own in spite of curtailed automobile demand. A few companies which make automobile body sheets

The Iron Age Composite Prices

Finished Steel

Aug. 27, 1929, 2.398c. a Lb.

One week ago	2.398c.
One month ago	2.412c.
One year ago	2.348c.
10-year pre-war average	1.688c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High		Low	
1929	2.412c.,	April 2;	2.331c.,	Jan. 8
1928	2.391c.,	Dec. 11;	2.314c.,	Jan. 3
1927	2.453c.,	Jan. 4;	2.293c.,	Oct. 25
1926	2.453c.,	Jan. 5;	2.403c.,	May 18
1925	2.560c.,	Jan. 6;	2.396c.,	Aug. 18

Pig Iron

Aug. 27, 1929, $18.25 a Gross Ton

One week ago	$18.42
One month ago	18.38
One year ago	17.34
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1929	$18.71,	May 14;	$18.25,	Aug. 27
1928	18.59,	Nov. 27;	17.04,	July 24
1927	19.71,	Jan. 4;	17.54,	Nov. 1
1926	21.54,	Jan. 5;	19.46,	July 13
1925	22.50,	Jan. 13;	18.96	July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c.
Del'd Philadelphia	2.27c.
Del'd New York	2.29c.
Del'd Cleveland	1.92½c. to 1.95c.
F.o.b. Cleveland	1.90c. to 1.95c.
F.o.b. Lackawanna	2.05c.
F.o.b. Birmingham	2.20c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	2.05c.
F.o.b. Pittsburgh mills, cut lengths	2.30c.
F.o.b. Birmingham, mill lengths	2.20c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.85c. to 1.90c.
F.o.b. Chicago Heights mill	1.95c.
Del'd Philadelphia	2.27c.

Iron

Common iron, f.o.b. Chicago	2.05c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c.
F.o.b. Birmingham	2.20c.
Del'd Cleveland	2.14c.
Del'd Philadelphia	2.15c.
F.o.b. Coatesville	2.05c.
F.o.b. Sparrow Point	2.05c.
F.o.b. Lackawanna	2.05c.
Del'd New York	2.22½c.
C.i.f. Pacific ports	2.35c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c.
F.o.b. Birmingham	2.20c.
F.o.b. Lackawanna	2.05c.
F.o.b. Bethlehem	2.05c.
Del'd Cleveland	2.14c.
Del'd Philadelphia	2.01c. to 2.06c.
Del'd New York	2.14½c.
C.i.f. Pacific ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	2.00c.
Wider than 6 in., P'gh	1.90c.
6 in. and narrower, Chicago	2.20c.
Wider than 6 in., Chicago	2.10c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.30c.
Bars, f.o.b. Chicago	2.30c.
Bars, Cleveland	2.35c.
Shafting, ground, f.o.b. mill	*2.65c. to 3.60c.
Strips, P'gh	2.75c. to 2.85c.
Strips, Cleveland	2.75c. to 2.85c.
Strips, del'd Chicago	3.05c. to 3.15c.
Strips, Worcester	2.90c. to 3.00c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.25c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland, to jobbers and retailers.)

	Base per Keg
Wire nails	$2.55 to $2.65
Galvanized nails	4.55 to 4.65
Galvanized staples	3.25 to 3.35
Polished staples	3c. to 3.10c.
Cement coated nails	$2.55 to $2.65
	Base per 100 Lb.
Bright plain wire, No. 6 to No. 9 gage	$2.40 to $2.50
Annealed fence wire	2.55 to 2.65
Spring wire	3.50 to 3.60
Galv'd wire, No. 9	3.00 to 3.10
Barbed wire, galv'd	3.20 to 3.30
Barbed wire, painted	2.95 to 3.05
Woven wire fence (per net ton to retailers)	65.00

Chicago district mill and delivered Chicago prices are $1 per ton above the foregoing. Birmingham mill prices $3 a ton higher; Worcester, Mass. (wire), mill $3 a ton higher on production of that plant; Duluth, Minn., mill $2 a ton higher; Anderson, Ind., $1 higher.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.70
Less carloads, Wheeling or Reading	2.80

Light Plates

No. 10, blue annealed, f.o.b. P'gh.	2.10c. to 2.20c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.30c.
No. 10, blue annealed, del'd Phila.	2.42c. to 2.52c.
No. 10, blue annealed, B'ham	2.35c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.25c. to 2.35c.
No. 13, f.o.b. Chicago dist.	2.45c.
No. 13, del'd Philadelphia	2.67c.
No. 13, blue annealed, B'ham	2.50c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago dist. mill	2.95c. to 3.00c.
No. 24, del'd Philadelphia	3.17c. to 3.27c.
No. 24, f.o.b. Birmingham	3.10c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	4.10c. to 4.20c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.50c. to 3.60c.
No. 24, f.o.b. Chicago dist. mill	3.60c. to 3.70c.
No. 24, del'd Cleveland	3.59c. to 3.69c.
No. 24, del'd Philadelphia	3.92c. to 4.02c.
No. 24, f.o.b. Birmingham	3.75c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	4.00c. to 4.10c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.35
Standard cokes, f.o.b. Gary	5.45

Terne Plate

(F.o.b. Morgantown or Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$11.20
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.30
25-lb. coating I.C.	$16.70
30-lb. coating I.C.	17.75
40-lb. coating I.C.	19.85

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quality Bar Base, 2.65c. to 2.75c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1½% Nickel)	0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅝ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.15
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	*Iron* Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ and ⅜	+13	+48
¼ to ⅜	47	30½	½	23	7
½	53	42½	¾	28	12
¾	58	47⅛	1 to 2	34	18
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	½	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on block by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		*Charcoal Iron*	
2 in. and 2¼ in.	40	1½ in.	1
2½ in.—2¾ in.	48	1¾ in.	8
3 in.	54	2 in.—2¼ in.	13
3¼ in.—3¾ in.	56	2½ in.—2¾ in.	16
4 in.	59	3 in.	17
4½ in. to 6 in.	48	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	63	3 in.	48
1¼ to 1½ in.	55	3¼ to 3½ in.	50
1¾ in.	39	4 in.	53
2 to 2¼ in.	34	4½, 5 and 6 in.	42
2½ to 2¾ in.	42		

Hot Rolled

2 and 2¼ in.	40	3¼ to 3½ in.	56
2½ and 2¾ in.	48	4 in.	59
3 in.	54	4½, 5 and 6 in.	48

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40%, base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

principally are rapidly reducing their backlogs, but others report specifications fully equal to July and almost sufficient to maintain the present high operating rate. The leading interest has scheduled its mills again this week at slightly under 100 per cent of capacity and has enough tonnage in the aggregate on its books to assure a high operating rate for about two months. Insistent pressure for deliveries is still being encountered frequently, and even on galvanized sheets, on which price competition is the keenest, delivery promises average about four weeks. Prices show little change. Talk of advances by leading independents has not materialized. Fourth quarter business on black sheets has been closed at 2.85c., Pittsburgh, although no producer has officially opened its books for that period. On current business, concessions from this figure have practically disappeared and blue annealed sheets seem to be steady at 2.35c., Pittsburgh, for the No. 13 gage. Occasional shading on light plates where wide strip competition is encountered is reported. On galvanized sheets, price conditions are still rather chaotic, although some makers continue to adhere to a 3.60c. price. A large part of current tonnages is being taken at figures about $2 under this. Automobile body sheets are being sold at 4c. to 4.10c., and metal furniture sheets at 4.10c. to 4.20c., Pittsburgh, with demand for the latter exceedingly strong.

Tin Plate.—Mill operations continue to decline, and, although the leading interest operated last week at between 85 and 90 per cent of capacity, the average for the industry was considerably lower. The larger independents report operating rates of from 50 to 75 per cent, and the lightness of specifications coming in just now promises little improvement for at least a month. By that time advance business for the coming season will begin to come out and mills will soon begin rolling on tonnage for the next year. Crop conditions are not promising, and the California fruit pack is no larger than was predicted.

Strip Steel.—Strip demand has declined to the point where sharp curtailment in mill operations can no longer be avoided, and practically all of the leading makers began the present week with reduced schedules. This condition is not expected to last much longer than the middle of September, when heavier requirements are expected from the automotive industry. August specifications for hot-rolled strip are expected to fall at least 25 per cent behind July and cold-rolled tonnage will also show a decline, although less pronounced. Some mills still have enough tonnage of the latter material on their books to last for three or four weeks. In the face of reduced demand prices are holding extraordinarily well. On hot-rolled material, no deviations from the full quoted schedules have been reported and cold-rolled is now well established at 2.75c. to 2.85c., Pittsburgh or Cleveland.

Coal and Coke.—With demand for furnace coke declining much more rapidly than production, prices have weakened, and this grade is now quotable at $2.65 to $2.75, Connellsville, a decline of 10c. a ton from recent minimums. At least 2500 ovens are still running in the coke region. This price weakness is expected to be only temporary, as demand is bound to improve in the fall and producers would be unwilling to make future commitments at the above figures. Foundry coke is not quotably weaker, although the market is very dull. The premium grades are not affected by the present weakness, although reduced shipments are also reported by makers of these brands. Coal prices show no tendency to become stabilized, although domestic demand is improving seasonably.

Old Material.—Sales to mills during the week have been negligible and such transactions as are reported do not justify any changes in the quotable market on No. 1 heavy melting steel. One mill in the district is reported to have bought at $18.50 but other small sales of first grade material have commanded as high as $19.25 and $19.50. Hydraulic compressed sheets are still very scarce in this district and sales are lacking. Dealers have been able to buy this material in the Pittsburgh district at $18.25 and less, and the market is now quoted at $18.25 to $18.75. Machine shop and short shoveling steel turnings are still bringing a good price from dealers who are covering on recent high priced sales, and small tonnages of steel turnings were sold during the week at $14. Machine shop turnings are quotable at $12.75 to $13.25 and are unchanged from the previous week. They were erroneously shown in this column last week at a price $1 a ton under this figure. The scrap market in general is awaiting the trend of steel operations, and will probably turn definitely either upward or downward after Labor Day. If there is any tendency at present, it is in the direction of weakness, and this trend will probably show itself in the bids on the Pennsylvania Railroad list, which are to be opened on Sept. 4. The list is an unusually large one, containing a total of 70,000 tons, of which 10,000 tons is No. 1 heavy melting steel and 13,400 tons rails.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$18.50 to $19.50
No. 2 heavy melting steel	16.50 to 17.00
Scrap rails	18.00 to 18.50
Compressed sheet steel	18.25 to 18.75
Bundled sheets, sides and ends	17.00 to 17.50
Cast iron carwheels	16.50 to 17.00
Sheet bar crops, ordinary	20.00 to 20.50
Heavy breakable cast	13.00 to 13.50
No. 2 railroad wrought	19.00 to 19.50
Hvy. steel axle turnings	16.50 to 17.00
Machine shop turnings	12.75 to 13.25
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	21.75 to 22.25
Railr. coil and leaf springs	21.75 to 22.25
Rolled steel wheels	21.75 to 22.25
Low phos. billet and bloom ends	22.50 to 23.00
Low phos., mill plates	22.50 to 23.00
Low phos., light grades	20.50 to 21.50
Low phos., sheet bar crops	20.50 to 21.50
Heavy steel axle turnings	16.50 to 17.00
Electric Furnace Grades:	
Low phos., punchings	20.00 to 21.00
Hvy. steel axle turnings	16.50 to 17.00
Blast Furnace Grades:	
Short shoveling steel turnings	13.50 to 14.00
Short mixed borings and turnings	12.50 to 13.00
Cast iron borings	12.50 to 13.00
Rolling Mill Grades:	
Steel car axles	21.50 to 22.00
Cupola Grades:	
No. 1 cast	15.00 to 16.00
Rails 3 ft. and under	20.00 to 21.00

Sales Prices of Ingot Brass in August

CHICAGO, Aug. 27.—The Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the 28-day period ended Aug. 16, as listed below. As there are, as yet, no generally accepted specifications for ingot brass, it must be understood that each item is a compilation representing numerous sales of metal known to the trade by the designation shown, but each item, in reality, includes many variations in formulae. Until the program of standardizing the principal specifications, now progressing in cooperation with the American Society for Testing Materials, is completed, the following specifications will be understood to refer to "commercial grades."

	C. per Lb.
Commercial 80-10-10 (1 per cent impurities)	17.011
Commercial 78 per cent metal	15.094
Commercial 81 per cent metal	15.386
Commercial 83 per cent metal	15.826
Commercial 85-5-5-5 metal	15.897
Commercial No. 1 yellow brass ingot	12.882

The Swedish Iron & Steel Corporation, 64 Rutledge Street, Brooklyn, N. Y., has removed its general offices to 17 Battery Place, New York.

Warehouse Prices, fo.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.80c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Light plates, blue ann'l'd (No. 10), 1 to 10 plates	3.45c.
Blue annealed sheets (No. 13), 1 to 10 sheets	3.60c.
Galv. corrug. sheets (No. 28), per square	$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black soft, ann'l'd, base per 100 lb.	$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	2.90 to 3.00
Cement coated nails, per keg	3.05

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10 in., Pittsburgh	$35.00
Rerolling, 4-in. and under 10 in., Youngstown	35.00
Rerolling, 4-in. and under 10 in., Cleveland	35.00
Rerolling, 4-in. and under 10 in., Chicago	37.00
Forging quality, Pittsburgh	$40.00 to 41.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$35.00
Youngstown	35.00
Cleveland	35.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$35.00
Youngstown	35.00
Cleveland	35.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$42.00
Cleveland	42.00
Chicago	43.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.50c.
Iron ore, basis Swedish, average 65% iron	11.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	32.00c. to 33.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	33.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$16.25 to $16.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.65 to $2.75
Foundry, f.o.b. Connellsville prompt	$3.75 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$23.00	10%	$27.00 to $28.00
7%	24.00	11%	29.00 to 30.00
8%	25.00	12%	31.00 to 32.00
9%	26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.25 to $18.75
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works: High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅛ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagons nuts	70
Semi-finished hexagons castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh	75, 20, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20, 10 and 5
Stove bolts in bulk, P'gh	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-In. and Larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(7/8-In. and Smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Production at Near-Capacity Rate, But Bookings Continue to Taper—10,000 Tons Southern Iron Bought

CHICAGO, Aug. 27.—Steel ingot production in this district remains at a near-capacity rate, but it is headed for a definite recession. The extent of the decline cannot be predicted because it will depend in part upon unknown quantities.

Opinions vary widely as to prospects in the automobile industry. Motor car output is believed to have increased slightly in August and will probably show a further gain next month. However, some well informed observers expect the September total to be the highest of any of the remaining months of the year. Another period of reduced activity in the final quarter would be in keeping with the belief that a recession is due to compensate for the extraordinary output of the first half of the year. It would also be in line with performance in previous years.

A fall rail buying movement is sure and there are indications that it may set in earlier than usual. The volume of railroad equipment business that will come out, on the other hand, is still uncertain. The Santa Fe, Illinois Central, Rock Island and Burlington are mentioned as probable buyers of large numbers of cars, but no definite information regarding such programs has yet been given out by the railroads themselves. Even if large equipment orders were placed at the present time, a number of important Western car shops would still face shutdowns of two to three months, since it takes that long to assemble materials. In fact, any cars placed in September will be for first-quarter delivery. The only cars actually pending in this market are 1000 for the St. Paul, 550 for the Central of Georgia and 400 for the Pacific Fruit Express. Figures have gone in on the cars for the last two roads, so that orders may be placed in a week or two.

Among the other large outlets for steel, the Milwaukee fabricator of pipe continues to take large quantities, although no additional pipe line business has been reported for some time.

Prospects in structural steel are regarded bright, but at current writing fabricators are estimating on very little work.

Farm equipment plants are still busy, although they have experienced a setback, described by some as a seasonal lull. A year ago they operated through the summer with virtually no curtailment of schedules. Business in combines has not been up to expectations and bookings in some types of tractors have declined. Among the reasons given for the recession in farm equipment business are the severe drought in Canada and the American Northwest and a cloudburst in Kansas. In the one case the crop yield was sharply reduced and in the other crops were destroyed.

Mill bookings continue to taper and deliveries are shortening. Books have not yet been opened for fourth quarter, except on cold-rolled strip, and there is little talk of changes in prices. Some producers will take advantage of the two days over Sunday and Labor Day to make imperative repairs on mill motors, postponed from July 4.

Pig Iron.—Sales of Southern iron in this district during the week totaled more than 10,000 tons. An Illinois sewing machine manufacturer bought 2000 tons and three Michigan stove companies closed for 7300 tons. One prominent Alabama producer has withdrawn from the market, but at least two others are still quoting $12.50, base, Birmingham, on foundry iron, and in at least one instance differentials in the higher silicon ranges have been waived. An inquiry for 1500 tons from a Wisconsin farm equipment maker is about to be closed. Prices on Northern iron are unchanged. Local furnaces have good backlogs and are booking a fair amount of fourth-quarter business. They are also receiving numerous orders for fill-in tonnages for the remainder of this quarter. The amount of spot business is testimony to the continued caution of users. There has been no overbuying and foundry stocks have been consistently at low level. Melt is well sustained and in some directions, notably among automotive foundries, shows signs of expanding. Shipments from Chicago furnaces in August are expected to show a slight gain over those of July, with the likelihood that they will equal those of June. The Iroquois and Federal furnaces now being repaired will be ready to relight soon. There is also the possibility of some local steel works pig iron reaching the market in September. Steel works blast furnaces have had little or no surplus iron thus far this year.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	$18.51 to 19.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—Activity is confined to spot sales of small lots. The trade is speculating on the effect that the proposed reduction in duty on ferromanganese, as recommended by the Senate Committee on Finance, will have on prices.

Prices delivered Chicago: 80 per cent ferromanganese, $112.56; 50 per cent ferrosilicon, $83.50 to $88.50; spiegeleisen, 19 to 21 per cent, $39.76 to $41.76.

Semi-Finished Steel.—While the leading interest has little semi-finished steel to offer in view of the large aggregate requirements of its own mills and its affiliated companies, material can be obtained without much difficulty from other producers. Moreover, some interests that recently scoured the open market for extra requirements are now piling steel from their own mills.

Warehouse Business.—Demand has declined no more than was to be expected at this time of month and at this season of the year. Business is still much better than that of twelve months ago.

Plates.—Deliveries continue to improve, though they still range from four to 10 weeks. Activity in railroad equipment is still at low ebb, but predictions are freely made that 10,000 to 12,000 cars will come into the market between now and Oct. 15. Demand for oil storage tanks has declined. Awards for the week total 2500 tons and new inquiries call for about the same tonnage. Mill prices on plates are unchanged at 2.05c., Chicago.

Sheets.—Specifications have shown some improvement. Deliveries range from four to five weeks and mill output from 80 to 85 per cent. Prices on blue annealed are holding, but weakness persists in galvanized.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3c. to 3.05c.; No. 24 galv., 3.65c. to 3.75c.; No. 10 blue ann'l'd, 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Bolts, Nuts and Rivets.—Specifications for bolts and nuts are in keeping with the seasonal lull in the farm equipment industry. Releases first showed a drop in July, although specifications for that month still proved 15 per cent higher than in July, 1928. Specifications in August have shown a further decline, but have been virtually equal to those of the corresponding month last year. Current business is sufficient to justify operations of 65 to 75 per cent in Western bolt and nut plants, although some companies are able to run at a higher rate by building up depleted stocks. For mill prices see page 565.

Bars.—Diminishing backlogs are reflected in easier deliveries, which range from four to six weeks for one local mill to three to four weeks for others. Farm equipment plants are not taking as much steel as 90 days ago, but on the whole are still very busy. The falling off in tractor production has been confined mainly to the large models, output of small tractors remaining heavy. The recession in activity is ascribed to the drought in Canada and the American Northwest. Mill prices on soft steel

bars are unchanged at 2.05c., Chicago. Demand for alloy steel bars is in keeping with conditions in the automobile industry. Reports received here indicate that motor car output may show appreciable recovery after the middle of September. Specifications for rail steel bars from the farm equipment makers have tapered somewhat, but releases from bed companies show no decline. One prominent bed maker expects his last half output to show a gain of 33 to 50 per cent over that for the first six months of 1929.

Rails and Track Supplies.—One local rail mill has virtually disposed of its obligations, but the other is still operating at 75 per cent and, following recent additions to existing contracts, will probably maintain that rate until October. The railroads are preparing their budgets earlier this year and there are some indications, possibly because of unavoidable delays in deliveries during the current year, that the fall buying movement will get under way sooner than usual. In certain quarters it is believed that inquiries for 20,000 tons of rails for shipment this year will come out before Sept. 15. The customary run of specifications in track supplies has been augmented by tonnages supplementing recent additions to rail contracts. Light rails are inactive.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Structural Material. — There has been further shortening of deliveries on plain material, with one mill offering shipments in three to four weeks and another in three to seven weeks. Construction prospects, however, are regarded as promising. Bridge work and industrial plant projects are a feature of current and pending activity. One of the rapidly growing new outlets for fabricated steel is the commercial airport. Five hangars taking an average of 1000 tons apiece have been placed in various parts of the country within the past 60 days. In the past week the Wayne County airport hanger, near Detroit, 1100 tons, was awarded to the R. C. Mahon Co. Fabricators in this district are short of work and bids on current jobs are highly competitive. Mill prices on plain material remain at 2.05c., Chicago.

Mill prices on plain material, per lb.: 2.05c. base, Chicago.

Reinforcing Bars.—A few large individual tonnages have been placed recently, but business in the aggregate shows no improvement and bending shop operations continue to range from 60 to 70 per cent of capacity. With the approach of fall, however, the desirability of getting projects under way before winter is becoming a factor, and the trade expects the next six weeks to be more active than any corresponding period so far this year. Prices are still flexible. The Kalman Steel Co. will supply 1000 tons for a Barrington, Ill., building of the Jewel Tea Co.

Cast Iron Pipe.—Aside from a fair run of business from contracts and scattered orders from public utilities, the market is quiet. Municipal buying remains light. Royal Oak, Mich., has awarded 450 tons of 6 and 8-in. pipe to the Lynchburg Foundry Co. Dearborn Township, Mich., has placed 30,000 ft. of 6 and 8-in. with the American Cast Iron Pipe Co. New Haven, Mo., has let 150 tons of 4, 6 and 8-in. to the McWane Cast Iron Pipe Co.

Prices per net ton, del'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $49.20 to $50.20; Class A and gas pipe, $3 extra.

Cold-Rolled Strip.—Demand from the automobile industry has shown no particular improvement, possibly because of stocks still in the hands of consumers, but motor car production is increasing and for the month of August will show a gain over July. The August output of the Ford Motor Co. is expected to reach 200,000 vehicles, a gain of 25,000 over the July total. Production of the Chevrolet Motor Co. has declined and for the month may not exceed 110,000 cars, compared with nearly 138,000 in July. This company expects to produce an average of 100,000 cars monthly during the rest of the year, which will bring the total output for the first year of its six-cylinder model to 1,400,000. This figure will surpass that for the first twelve months' production of the present Ford model. The leading producer of cold-rolled strip has opened books for the fourth quarter at 2.75c. to 2.85c., Cleveland or Pittsburgh, or 3.05c. to 3.15c., delivered Chicago, the prices now ruling.

Wire Products.—Jobbers' specifications have increased somewhat, but the current volume of business is still considerably below that of a year ago. Mills have not yet opened books for fourth quarter. Production remains at 65 per cent of capacity. Mill prices, which have shown no significant change, are printed on page 565.

Hot-Rolled Strip.—Mill operations have dropped materially in the last few weeks in accord with the recent decline in automobile production. Mill capacity in this district will be expanded by the construction of a new mill at Gary, now under way, and the revamping of the other mills at that plant.

Old Material. — The week has brought out no further important consumer purchases of basic open-hearth grades. The failure of the market to advance to $16 or higher on the mill orders for heavy melting steel placed a week ago was a surprise, in view of high prices recently paid by dealers, but there is no doubt that steel companies have become less concerned about supplies because of probable curtailment in their open-hearth operations next month. Other grades continue to show evidences of strength, with aggregate demand still large and prices firm or rising. The St. Paul took bids on 5000 tons yesterday.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$15.25 to $15.75
Shoveling steel	15.25 to 15.75
Frogs, switches and guards, cut apart, and misc. rails	16.75 to 17.25
Hydraul. compressed sheets	13.75 to 14.25
Drop forge flashings	10.75 to 11.25
No. 1 busheling	13.25 to 13.75
Forg'd cast and r'l'd steel carwheels	18.75 to 19.25
Railroad tires, charg. box size	18.75 to 19.25
Railroad leaf springs cut apart	18.75 to 19.25
Acid Open-Hearth Grades:	
Steel couplers and knuckles	17.00 to 17.50
Coil springs	19.00 to 19.50
Electric Furnace Grades:	
Axle turnings	14.50 to 15.00
Low phos. punchings	17.00 to 17.50
Low phos. plates, 12 in. and under	17.00 to 17.50
Blast Furnace Grades:	
Axle turnings	13.00 to 13.50
Cast iron borings	10.50 to 11.00
Short shoveling turnings	10.50 to 11.00
Machine shop turnings	7.50 to 8.00
Rolling Mill Grades:	
Iron rails	16.00 to 16.50
Rerolling rails	18.00 to 18.50
Cupola Grades:	
Steel rails less than 3 ft.	17.50 to 18.50
Steel rails less than 2 ft.	20.00 to 20.50
Angle bars, steel	17.00 to 17.50
Cast iron carwheels	14.00 to 14.50
Malleable Grades:	
Railroad	17.00 to 17.50
Agricultural	15.50 to 16.00
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angle and splice bars	15.00 to 15.50
Iron arch bars and transoms	21.50 to 22.00
Iron car axles	26.50 to 27.00
Steel car axles	17.50 to 18.00
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	13.75 to 14.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	7.00 to 7.50
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	10.00 to 10.50
Cupola Grades:	
No. 1 machinery cast	14.50 to 15.00
No. 1 railroad cast	14.00 to 14.50
No. 1 agricultural cast	13.25 to 13.75
Stove plates	12.25 to 12.75
Grate bars	11.75 to 12.25
Brake shoes	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	2.15c. to 2.35c.
Reinforc'g bars, rail steel	1.85c. to 1.95c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (⅞ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ⅝ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	3.20
Cement c't'd nails, base per keg	3.20

New York

Pig Iron Sales Gain with Southern Sellers Extending Activity—August Steel Buying Below That of July

NEW YORK, Aug. 27.—Sales of pig iron in the past week showed a considerable increase, with a total in excess of 17,000 tons. Some sizable single orders included about 1000 tons for a New Jersey consumer, placed with a northern New York producer, but most of the 17,000 tons was made up of small lots, some for third quarter, but largely for last quarter delivery. Consumers' stocks of foundry iron are not heavy, and some of the present buying is attributed to the activity of Southern sellers offering the foundry grade at $13 to $13.50 a ton, Birmingham, which stimulates consumers to obtain comparative prices from their usual sources of supply and results often in an order for a small tonnage of either Northern or Southern iron. Of the total business in the past week, it is estimated that about 3000 tons was sold by Southern furnaces. Northern producers have good backlogs on their books, but competition from the South makes the price situation somewhat irregular. In one instance, a Birmingham furnace quoted $20 a ton, delivered to northern New Jersey, for No. 1X foundry iron. Buffalo sellers are quoting $18 a ton, furnace, for foundry iron, but $17.50 a ton is still obtainable by buyers when a sizable tonnage is involved, or there is competition from Southern iron. Eastern Pennsylvania producers occasionally meet this competition. Southern sellers are quoting $13 to $13.50 a ton for foundry grade. Recent inquiries include 4,000 to 5,000 tons of various grades of foundry iron and 180 tons of low phosphorus iron for plants of the General Electric Co. Manning, Maxwell & Moore, Inc., New York, is in the market for 150 tons of foundry iron for Fitchburg, Mass. No. 2 furnace at Port Henry, N. Y., went out of blast Aug. 21 for relining, but will be blown in early in October.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$22.41 to $22.91
*Buf. No. 2, del'd east. N. J.	20.78 to 21.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	20.39 to 21.52
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	20.89 to 22.02

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Warehouse Business.—Buying from stock has been light in the past week and not much improvement is expected until after Labor Day. Black and galvanized sheet prices are still subject to concessions of $1 to $2 a ton, and blue annealed sheet prices are also shaded. Structural material is not being bought at present, but fall buying is expected early next month.

Cast Iron Pipe.—Business is in most cases limited to small lots for private buyers, with some municipal orders pending. Bids have been opened by the Department of Water Supply, Gas and Electricity, New York, on contracts requiring about 1100 tons of 20-in. and 24-in. water pipe. Ogdensburg, N. Y., will open bids Aug. 28 on 75 tons of 3-in. to 12-in. pipe and fittings, and Montclair, N. J., has opened bids on 35 tons of 6-in., Class B pipe. At the recent opening of bids on 150 tons of Class C, 6-in. pipe by Bloomfield, N. J., the low bid was $34.50 a net ton, delivered, quoted by R. D. Wood & Co., Florence, N. J.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $33.60 to $34.60; 4-in. and 5-in., $36.60 to $37.60; 3-in., $43.60 to $44.60. Class A and gas pipe, $3 extra.

Reinforcing Bars. — The Kalman Steel Co. has been awarded 450 tons of bars for an industrial plant at Rensselaer, N. Y. The Taylor-Davis Co. will supply 1200 tons for a hosiery factory at Philadelphia. Bids are being taken on about 1500 tons of bars for a Pennsylvania Railroad warehouse in Jersey City. The volume of work ranging from 100 tons downward continues plentiful. Quotations are firm and unchanged.

Billet steel reinforcing bars in 40, 50 and 60-ft. lengths, 2.05c. per lb., Pittsburgh, and 2.30c. per lb., Pittsburgh warehouse, for cut lengths. Out of New York warehouse, 2.90c. per lb. for lots of 5 tons or more, 3.05c. for lots of 2 to 5 tons and 3.30c. for less than 2 tons, all delivered at job.

Finished Steel.—From the standpoint of fresh bookings, August has failed to keep pace with July, and in some cases the recession has been of considerable proportions. Sales of bars, shapes and plates have consisted mostly of small tonnages to companies in widely diversified manufacturing lines. The quietness in the market is attributed partly to the effects of the vacation season. Prices are steady and there are no indications of a change in the immediate future. Sellers are of the opinion that the volume of business will turn upward early in September. Lessened activity is noted in structural steel, but the amount of pending work is large. The most important award of the week was 1700 tons for a highway bridge in New Jersey. A commissary building on 161st Street, New York, for the New York Central Railroad will require 3000 tons of steel. The placing of 13,200 tons for a subway section in Queens is not expected until after Sept. 9. District offices of sheet steel makers report a slight gain in specifications and orders. Substantial tonnages of galvanized sheets for roofing purposes have been sold in the South, and the roofing season in that district has been fully up to normal. Prices have not changed, with galvanized stock selling at 3.50c., Pittsburgh, black at 2.85c. and blue annealed at 2.35c. for No. 13 gage. Quotations of wire goods have continued rather soft. Mills are understood to be taking

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Cold-roll. strip, soft and quarter hard	5.15c. to 5.40c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.85c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.65c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
½-in. butt	46	29
¾-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
½-in. butt	5	+19
¾-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.80c.
No. 22	3.95c.
No. 24	4.00c.
No. 26	4.10c.
No. 28*	4.25c.
No. 30	4.50c.

Sheets, Galvanized

	Per Lb.
No. 14	4.40c.
No. 16	4.25c.
No. 18	4.40c.
No. 20	4.50c.
No. 22	4.60c.
No. 24	4.75c.
No. 26	5.00c.
No. 28*	5.25c.
No. 30	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

orders for common wire nails at $2.55 a keg, Pittsburgh, or lower, and for plain wire at $2.40 a 100 lb., Pittsburgh.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.29c.; plates, 2.22½c.; structural shapes, 2.19½c.; bar iron, 2.14c.

Coke.—Standard furnace coke is inactive and the price is unchanged at $2.75 to $2.85 per net ton, Connellsville. Special brands of beehive foundry coke are quoted at $4.85 per net ton, ovens, or $8.56 a net ton, delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn. By-product coke is quoted at $9 to $9.40 a net ton, Newark or Jersey City, and $10.06, New York or Brooklyn.

Old Material.—A large eastern Pennsylvania consumer has closed on about 25,000 tons of No. 1 heavy melting steel at $16.50 a ton, delivered, the same price as was paid by this consumer on its last previous purchase. Brokers are paying $16 to $16.50 a ton, delivered eastern Pennsylvania for No. 1 steel, the price depending upon the shipment. A shortage of good No. 2 heavy melting steel is reported by some brokers shipping to eastern Pennsylvania, but this is attributed to the increased tonnage of this grade being shipped to the consumer at Bethlehem, which accepts No. 2 steel at $1.50 to $2 a ton less than the price for No. 1 heavy melting steel.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$12.75 to $13.35
Heavy melting steel (yard)	8.00 to 9.75
No. 1 hvy. breakable cast.	10.75 to 11.75
Stove plate (steel works)	8.00 to 8.25
Locomotive grate bars	8.25 to 8.75
Machine shop turnings	7.75 to 8.00
Short shoveling turnings	8.00 to 9.00
Cast borings (blast furn. or steel works)	7.00 to 7.75
Mixed borings and turnings	6.75 to 7.75
Steel car axles	19.50 to 20.00
Iron car axles	24.00 to 25.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	10.75
Forge fire	9.75 to 10.25
No. 1 railroad wrought	12.00 to 12.50
No. 1 yard wrought, long	11.00 to 11.50
Rails for rolling	13.25 to 13.75
Cast iron carwheels	12.50 to 13.00
Stove plate (foundry)	8.00 to 8.50
Malleable cast (railroad)	14.00 to 14.50
Cast borings (chemical)	10.00 to 10.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$17.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	15.00
No. 2 cast (radiators, cast boilers, etc.)	14.50

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to ⅛ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.70c. to 3.90c.
Galvanized sheets (No. 24)	4.60c. to 4.75c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb.	$2.90
No. 9 gal. wire, per 100 lb.	3.35
Com. wire nails, base per keg	2.90

*Net base, including boxing and cutting to length.

Cleveland

Prompt Deliveries of Steel Possible and Backlogs Being Reduced—Steady Volume of Pig Iron Buying

CLEVELAND, Aug. 27.—The volume of business in finished steel declined somewhat last week. With the slowing down during the previous week orders for the last half of August will be somewhat less than those for the first half. However, some of the mills have booked more tonnage at a higher rate this month than in July. Backlogs on most products are being gradually reduced and fairly prompt deliveries can now be made. Some mills need orders for full finished sheets and for hot and cold strip steel. So far there has been little curtailment in mill operations, although some sheet mills are no longer running at capacity.

The automotive industry has further curtailed production and its specifications for steel. The Chevrolet Motor Co. is understood to have greatly reduced its orders for steel preparatory to cleaning up stocks and bringing out new models in October. Several other motor car companies have not yet got under production on new models and those with new designs are placing specifications rather sparingly. However, the Ford Motor Co. is keeping up its daily output of 8000 cars. Forge shops in this territory making automotive parts are reported to be operating at 35 to 60 per cent of capacity. Automobile stamping plants have also materially reduced their operations.

The agricultural implement industry continues in good operation. While there has been some curtailment of other metal-working industries, they generally are operating well for this time of the year. Consumers are as yet showing no interest in fourth quarter contracts and there is no discussion of prices for that delivery.

Iron Ore.—Lake Superior iron ore is still being consumed at a rate of close to 6,000,000 tons a month. The amount used in July was 5,808,473 tons, a gain of 131,821 tons over June, which had one less day, according to the monthly report of the Lake Superior Iron Ore Association. The amount used in July last year was 4,632,907 tons. Ore at furnaces Aug. 1 amounted to 24,245,139 tons. The total at furnaces and Lake Erie docks Aug. 1 was 28,697,239 tons, as compared with 27,208,622 tons on the same day a year ago. Central district furnaces during July consumed 2,901,232 tons, an increase of 46,491 tons over June. Lake front furnaces, including Canadian furnaces, used 2,585,411 tons, a gain of 73,222 tons. Eastern furnaces consumed 151,448 tons, an increase of 7459 tons, and all-rail furnaces smelted 170,382 tons, a gain of 4649 tons. There were 196 furnaces in blast using Lake ore July 31, a decrease of one for the month.

Pig Iron.—Furnaces continue to sell a moderate volume of foundry and malleable iron, mostly in small lots for delivery usually extending through the remainder of the year. Business taken by Cleveland interests during the week aggregated 23,000 tons, as compared with 20,000 tons during the previous week. There is more activity in the Buffalo than in the northern Ohio or Michigan territories. Shipments are fair for this season of the year, although they will not be quite as heavy this month as in July. The automotive industry, which cut its shipping schedule sharply in July, has not increased its orders this month and, in fact, some motor car foundries are taking less iron than in July. Recent low prices on Southern foundry iron have been withdrawn and producers are quoting this iron at $14.50, Birmingham. While the price cut had a sentimental effect on the market, the lower prices do not appear to have brought out any business in the northern Ohio territory, as the reduction did not seem enough inducement for consumers to use a different grade of iron than they had been accustomed to for some time. Prices of Northern foundry iron are steady at $18.50, Cleveland, for outside shipment, $19 for local delivery, and $20, Lake furnace, for shipment to Michigan points.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., 1.75 to 2.25	$20.00 to 20.50
Malleable	19.50
Ohio silvery, 8 per cent	28.00
Basic Valley furnace	18.50
Stand. low phos., Valley	26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6 from Birmingham.

Steel Bars, Plates and Structural Material.—Specifications declined the past week, the falling off being most noticeable in steel bars, which is due to the lessened demand from the automotive industry. Most of the bar mills are now in position to make fairly prompt shipments. Specifications for alloy steel bars are light and there is not much demand for reinforcing bars. Plate deliveries by some mills are easier but with others no improvement is noted. Demand for structural shapes is holding up fairly well. Little inquiry came from the building field during the week, although several good sized jobs are pending. The Lorain-Central bridge, Cleveland, is expected to come out for bids next month. This will require 15,000 to 18,000 tons of structural steel. No deviation is reported from regular prices, which are 1.90c. to 1.95c., Cleveland, for steel bars, and 1.95c., Pittsburgh, for plates and shapes.

Sheets.—New demand was light the past week. Deliveries have further improved, particularly on full fashioned sheets, and some mills need orders for that grade. However, pro-

ducers still have good backlogs of black sheets, with fall commitments as high as six weeks. Orders from the steel barrel industry have shown an improvement and the demand from other industries outside of the automotive field is holding up well. Prices are fairly steady. Black sheets are firm at 2.85c., Pittsburgh. While not common, there are still reports of $2 a ton concessions to 2.25c., for blue annealed and 2.10c. for light blue annealed plates.

Wire Products. — Manufacturers' wire is in fair demand and appears to be holding to 2.50c. in Cleveland, but 2.40c. is commonly quoted outside, and local jobbers are buying plain wire at the lower price. The nail situation continues very unsatisfactory in volume and price.

Cold-Finished Steel Bars.—Demand has declined sharply this month, as screw machine and upsetting plants have reduced operations owing to lack of orders from the automotive industry. The 2.35c., Cleveland, price is being maintained.

Warehouse Business. — Demand is fair, although not so good as in July. While orders are plentiful, they are mostly for small lots. Plates and blue annealed sheets are among the more active items. Prices are firm.

Strip Steel.—Specifications for hot and cold-rolled strip, which fell off with the curtailment of the automotive industry, have not picked up this month. While mills are getting a fair amount of business against contracts, shipments are in excess of incoming orders. Some mills still have a six weeks' backlog in wide strip orders, but need tonnage in narrow material, while others still have good backlogs of narrow strip, but need orders for wide material. The need of orders for cold-rolled strip has become more pronounced. While most mills are now quoting this at 2.85c., Cleveland and Pittsburgh, the 2.75c. price has not disappeared.

Coke. — Ohio by-product foundry coke has been reestablished at $8.25, ovens, for September shipment. The volume of business is good for this time of the year. Connellsville foundry coke is quiet and prices are unchanged. Producers continue to sell by-product coke for domestic use in good volume for fall shipment. The market appears firm at $4.50, ovens, for egg coke and $4 for nut.

Bolts, Nuts and Rivets.—Specifications for bolts and nuts are coming out in about the same volume as last month and are good from jobbers and from manufacturing industries except the automotive field. Rivets are moving slightly better than last month. Attempts are still being made to secure concessions from the $3.10 price for large rivets, but apparently without success.

Old Material—Scrap is coming out more freely than recently, but is fairly firm except on blast furnace grades. While local mills are taking a moderate amount of scrap on contract, they are not making any new purchases. There is a fair volume of activity among dealers. No. 1 railroad steel is bringing $17 a ton from dealers for local delivery, an advance of 50c. a ton, and dealers would probably pay $17.25 for a round tonnage. Dealers are paying $15.25 to $15.50 for ordinary heavy melting steel scrap for delivery to another local consumer. Short shoveling turnings have advanced 50c. a ton. A local mill paid $12.50 for a small lot. Dealers are paying $10.50 for machine shop turnings for Youngstown delivery. Blast furnace scrap is being freely offered at $10.50.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$15.25 to $15.50
No. 2 heavy melting steel	14.50 to 14.75
Compressed sheet steel	15.50 to 16.00
Light bundled sheet stampings	12.00 to 12.50
Drop forge flashings	13.00 to 13.25
Machine shop turnings	9.75 to 10.25
Short shoveling turnings	11.75 to 12.25
No. 1 railroad wrought	13.50 to 14.00
No. 2 railroad wrought	16.00 to 16.50
No. 1 busheling	13.25 to 13.75
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet, bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	10.50 to 10.75
Mixed borings and short turnings	10.50 to 10.75
No. 2 busheling	10.50 to 10.75
Cupola Grades:	
No. 1 cast	17.50 to 18.00
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	18.50 to 19.00
Miscellaneous:	
Railroad malleable	18.00 to 18.50
Rails for rolling	16.25 to 16.50

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel planished	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.60c.
Cold-fin. steel, sq. and flats	4.10c.
Steel hoops	3.55c.
Steel bands, No. 12 to ⅜-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	4.10c.
†Galvanized sheets (No. 24)	4.85c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more: 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more: 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Philadelphia

Steel Specifications Curtailed By Holiday — Pipe Shops Buy 20,000 Tons of Southern Iron

PHILADELPHIA, Aug. 27.—Steel and pig iron buying has been temporarily delayed in many cases by the approach of Labor Day, but steel mills are maintaining high operating rates, and current and prospective business in plates is large, with close to 50,000 tons of business in prospect for car and ship building. Shape mills are also maintaining good operating rates, but shape prices show no tendency to advance.

Pig iron is active and, with Birmingham producers curtailing operations, eastern Pennsylvania furnaces foresee a more stable market.

Reinforcing bar prices are irregular and both billet and rail steel bar makers are granting considerable concessions on desirable business.

Pig Iron.—A good volume of inquiry for foundry iron to be delivered in the third and last quarter has accumulated in the past week and a substantial tonnage of foundry iron has been closed, most of the orders going to Southern furnaces. One interest in the Birmingham district has sold about 50,000 tons of iron to various districts in the past week and withdrawn from the market, blowing out its furnace. Sales of Birmingham iron in this district have included 15,000 tons to a Florence, N. J., pipe foundry and 5000 tons to a Burlington, N. J., pipe interest. Quotations on Southern foundry iron continue at $13 to $13.50 a ton, furnace. The American Engineering Co., Philadelphia, has not yet closed on 500 tons of foundry iron and purchase is not expected for a fortnight or more. The Coatesville Boiler Works, Coatesville, Pa., has closed on 250 tons of No. 2X foundry iron with an eastern Pennsylvania producer. Foundry iron is quoted by eastern Pennsylvania furnaces at $21, base, and any concession from this price would be only on sizable tonnages.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$21.26 to $21.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.76 to 22.26
East. Pa. No. 1X	22.26 to 22.76
Basic (del'd east. Pa.)	19.75 to 20.25
Gray forge	20.00 to 20.50
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. br'g low phos. (f.o.b. furnace)	23.50 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	24.04
Va. No. 2X, 2.25 to 2.75 sil.	24.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Mill deliveries are fairly prompt, but operating rates are still high and prices firm at 1.95c. per lb., Pittsburgh, or 2.27c., delivered Philadelphia.

Reinforcing Bars.—Competition between billet and rail steel bars has become unusually keen with distributers of billet steel bars meeting the

rail steel bar quotation of 1.95c., Franklin, Pa., or Tonawanda, N. Y., or 2.27c., delivered Philadelphia, which has forced some rail steel bar sellers to offer considerable concessions to obtain any business. Occasionally distributers, who have quoted on a project to furnish rail steel bars, find it advantageous to furnish billet steel. The Farm Show Building in Harrisburg, requiring 800 tons of reinforcing bars, brought out a low bid of $1,840,000, but all bids were rejected as only $1,000,000 is available for the project. Billet steel bars are quoted at 1.95c. to 2c., Pittsburgh, or 2.27c. to 2.32c., delivered Philadelphia, with the $5 extra for cutting to length sometimes disregarded by the seller.

Shapes.—A substantial tonnage of business is being booked and mills are as well engaged as during July. Prices, however, are unchanged at 1.95c. to 2.05c., nearest mill to consumer, or 2.01c. to 2.11c., delivered Philadelphia. Some good business is in prospect for ships to be built by the New York Ship Building Corporation, Camden, N. J., and for railroad cars to be constructed by the American Car & Foundry Co., probably at Berwick, Pa.

Plates.—Mills are fully engaged and have in prospect about 30,000 tons of plates for four ships for the Export Steamship Corporation and 5000 tons of plates in a cruiser for the United States Navy to be built by the New York Ship Building Corporation at Camden, N. J. A substantial tonnage of plates will be required for the 1000 freight cars for the Delaware, Lackawanna & Western Railroad, which will probably be built at Berwick, Pa. Recently, universal mills have been operated at a higher rate than for some time and a plate mill in the Pittsburgh district, which produces pipe, is almost out of the market on universal plate skelp. Plate prices are unchanged at 2.05c., Coatesville, or 2.15c., delivered Philadelphia.

Sheets.—Blue annealed sheet prices are unchanged at 2.35c., Pittsburgh, or 2.67c., delivered Philadelphia, for No. 13 gage and light plates, blue annealed, No. 10 gage, are quoted at 2.20c., Pittsburgh, or 2.52c., delivered Philadelphia. The New York Ship Building Corporation, Camden, N. J., is inquiring for a carload or more of black sheets for the United States Navy cruiser, which it is building. Black sheets are unchanged at 2.85c., Pittsburgh, or 3.17c., delivered Philadelphia. Galvanized sheets are in good demand and prices range from 3.55c. to 3.60c., Pittsburgh, or 3.87c. to 3.92c., delivered Philadelphia.

Imports.—In the week ended Aug. 24, a total of 1332 tons of pig iron arrived at this port, of which 1230 tons was from British India and 102 tons from Norway. Steel imports consisted of 102 tons of structural shapes and 15 tons of steel scrap from Germany and 497 tons of structural shapes, 75 tons of steel bands and 47 tons of steel bars from Belgium.

Old Material.—Available supplies of good No. 2 heavy melting steel are not large and with a heavy tonnage of this grade moving to the consumer at Bethlehem, Pa., dealers report some difficulty in securing material to fill orders at Conshohocken, Phoenixville and Harrisburg, Pa. The consumer at Bethlehem, Pa., has closed on 25,000 tons of No. 1 heavy melting steel at $16.50 a ton, delivered. Short shoveling turnings have been bought by dealers at $12.50 a ton, delivered eastern Pennsylvania and the market on cast borings is firmer. Heavy breakable cast is quiet and buyers are unwilling to pay more than $14.50 a ton, while sellers are asking $15, delivered.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$16.50 to $17.00
Scrap T rails	16.00 to 16.50
No. 2 heavy melting steel	12.50 to 14.50
No. 1 railroad wrought	16.00 to 16.50
Bundled sheets (for steel works)	11.50
Hydraulic compressed, new	14.50 to 15.50
Hydraulic compressed, old	12.00 to 12.50
Machine shop turnings (for steel works)	12.00
Heavy axle turnings (or equiv.)	14.00 to 14.50
Cast borings (for steel works and roll. mill)	11.00 to 11.75
Heavy breakable cast (for steel works)	15.00
Railroad grate bars	12.00 to 12.50
Stove plate (for steel works)	12.00 to 12.50
No. 1 low phos., hvy., 0.04% and under	22.00 to 23.00
Couplers and knuckles	19.50 to 20.50
Rolled steel wheels	19.50 to 20.50
No. 1 blast f'nace scrap	10.50 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	15.00
Shafting	19.00 to 20.00
Steel axles	23.00 to 23.50
No. 1 forge fire	14.00
Cast iron carwheels	16.50 to 17.00
No. 1 cast	16.50 to 17.00
Cast borings (for chem. plant)	14.50
Steel rails for rolling	16.50 to 17.00

Steel Corporation Retires Subsidiary Bonds

The United States Steel Corporation has recommended that bonds of two of its subsidiaries be called for redemption on Nov. 1. They are bonds of the Indiana Steel Co. (first mortgage 5 per cent bonds due 1952) of a face value of $20,979,000 and the National Tube Co. (first mortgage 5 per cent bonds due 1952) of $10,971,000.

The operation calls for an aggregate sum of $33,358,500, funds for which have been provided from current resources. "It is estimated that through the retirement of these two issues of bonds the net cash saving in interest and sinking fund requirements will amount to approximately $730,000 annually," says Corporation's statement.

Will Make Electric Furnaces

The Bellevue Industrial Furnace Co., Detroit, has added an electric furnace division, thus to make a complete line of combustion furnaces.

Arnold Pfau, formerly connected in a consulting capacity with the Globar Corporation, has taken charge of the electric furnace division.

Canada

No Let Up in Sight in Dominion Business

TORONTO, ONT., Aug. 27.—Despite the fact that mills and foundries and other concerns associated with the iron and steel industry have been operating at almost capacity from the first of the year, there is little prospect of curtailed production among the various plants in the immediate future. Foundries and rolling mills continue at capacity, with the majority reporting backlogs sufficient to maintain present operations to the end of the year.

Pig Iron.—The general tone of the market is steadily becoming brighter. While no large orders have been closed during the week, individual tonnages are being stepped up to some extent and total sales are improving each week. Foundry iron has a strong call in the Toronto and Montreal districts for spot delivery. Shipments against contracts continue in good volume. Inquiries for fourth quarter are appearing. Prices are firm but unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$24.60
No. 2 fdy., sil. 1.75 to 2.25	24.10
Malleable	24.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$26.00
No. 2 fdy., sil. 1.75 to 2.25	25.50
Malleable	26.00
Basic	24.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Old Material.—More active trading is reported by local dealers. The demand is mostly for small lots for spot delivery, but total sales for the week were in greater tonnage than those of earlier summer weeks.

Dealers' buying prices:

Per Gross Ton

	Toronto	Montreal
Heavy melting steel	$10.00	$8.50
Rails, scrap	11.00	9.00
No. 1 wrought	10.00	12.00
Machine shop turnings	7.50	5.00
Boiler plate	7.50	6.00
Heavy axle turnings	8.00	7.50
Cast borings	7.50	5.00
Steel turnings	7.50	6.50
Wrought pipe	6.00	6.00
Steel axles	15.00	20.00
Axles, wrought iron	17.00	22.00
No. 1 machinery cast	....	17.00
Stove plate	....	13.00
Standard carwheels	....	16.00
Malleable	....	13.00

Per Net Ton

No. 1 mach'ry cast	$16.00	....
Stove plate	12.00	....
Standard carwheels	15.00	....
Malleable scrap	14.00	....

Russia Buys German Plates

HAMBURG, GERMANY, Aug. 12.—The Vereinigte Stahlwerke A. G., Düsseldorf, has received a contract from the Russian Government to supply all ship plates and structural material needed by Russian shipyards during 1930. The shipbuilding program of these yards is reported as eight to ten vessels.

Pacific Coast

Steel Prices Well Maintained—Bridge Takes 1150 Tons of Bars—Another Requires 8000 Tons of Shapes

SAN FRANCISCO, Aug. 24 (*By Air Mail*).—Movement of iron and steel products during the past week was confined, with few exceptions, to unimportant tonnages, and few new inquiries for tonnage lots came up for figures. The outstanding award of the week went to the Northwest Steel Rolling Mills and called for 1150 tons of reinforcing steel bars for the West Garfield Street bridge, Seattle. Bids were opened on 8000 tons of structural shapes for a bridge at Portland and on 1385 tons of cast iron pipe for Oakland, Cal. The price structure appears to be well maintained.

Pig Iron. — Little of real importance transpired in the pig iron market, sales and inquiries having been limited to small lots. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars. — Demand for reinforcing steel bars is by no means heavy, the majority of lettings calling for lots ranging from 30 to 60 tons. The Soule Steel Co. took 100 tons for a college building in Pasadena, Cal. Several fair-sized tonnages are pending, including 2300 tons for a wharf at Ninth Street, Oakland, 285 tons for paving work in Marin County, Cal., and 210 tons for a wharf at Fourteenth Street, Oakland. Out-of-stock quotations continue on a fairly firm basis in the San Francisco district at 2.30c., base, on carload lots and at 2.60c. on smaller tonnages. In Los Angeles, carload quantities are being quoted at 2.40c., base, and 2.70c. applies on less-than-carload lots. Movement of merchant bar steel is restricted to unimportant lots composed of numerous sizes. On this class of material, 2.35c., c.i.f., prevails.

Plates.—No large bookings were reported this week, and few inquiries of importance are before fabricators for figures. No action has yet been taken on 3000 tons for a pipe line at Bremerton, Wash. Bids will be opened next week on 10,000 tons for a riveted pipe line at Everett, Wash. Prices appear to be firm at 2.35c., c.i.f. Coast ports.

Shapes. — Most of the structural lettings this week called for lots of less than 100 tons. The McClintic-Marshall Co. took 140 tons for an apartment building on Pacific Street, San Francisco. Bids were opened this week on 8000 tons for a bridge in Portland and on 1000 tons for a hotel in Oakland. New inquiries include 738 tons for a bridge near Yreka, Cal., bids on which are to be opened Sept. 11. Domestic shapes continue firm at 2.35c., c.i.f.

Cast Iron Pipe.—Awards of cast iron pipe, with two exceptions, were confined to lots of less than 100 tons. The Heafey-Moore Co., Oakland, secured 199 tons of 4 to 8-in. Class B pipe for Alturas, Cal. An unnamed interest took 162 tons of 6 and 8-in. Class B pipe for Great Falls, Mont. Bids were opened this week on 1385 tons of 6 to 12-in. Class B pipe for the East Bay Municipal Utility District, Oakland. Los Angeles will open bids on Aug. 27 for 192 tons of 2-in. Class B pipe. Anaheim, Cal., opened bids this week on 377 tons of 6 to 10-in. Class B pipe. On Aug. 26 Coquille, Ore., will open bids on 303 tons of 10-in. Class B pipe.

Steel Pipe.—Demand for oil country goods has improved during the past week or two and, while few large lots have been reported, distributers are ordering replacements, which in the aggregate have involved large tonnages, one interest reporting orders totaling over 2000 tons during the past 10 days. The Pacific Gas & Electric Co., San Francisco, has withdrawn its inquiry for 2263 tons of 8⅝-in. O. D. gas pipe for installation in Monterey, Salinas and Gilroy. This company has an inquiry out for 38,000 ft. of 8⅝-in. O. D. plain end pipe weighing 24.496 lb. per ft. involving 465 tons and also another inquiry for 260 tons of 1¼ to 4-in. standard pipe.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.15c.
Soft steel bars	3.15c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.30c.
Struct. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Birmingham

Sales of Iron as Low as $12 Reported—Ensley Rail Mill Shuts Down

BIRMINGHAM, Aug. 27.—Southern sales of pig iron have been light, owing to previous placement of requirements. Most of the important buyers had covered their needs for August when the month began and they have, likewise, bought through September. However, next month's melt will require more iron than has been booked at this time and additional buying is looked for within the next two weeks. The daily run of small business continues at an even rate. Southern demand during the remainder of the quarter will just about take care of current production, while the aggressive bidding for tonnage in the Eastern and Middle Western markets will result in the moving of yard stocks. Shipments this month by the three merchant producers in the Birmingham district have been ahead of their make. Quotations in the Southern market continue on the $14.50 base, but various concessions are being made at competitive points, and prices as low as $12 are reported. The Tennessee company last week banked Bessemer No. 4, which has been on recarburizing iron. Central Iron & Coal Co., at Holt, Ala., also blew out its stack. This furnace, on foundry iron, had been in operation for 39 months on the same lining, and will be out for several months because of the present condition of the market. It will be relined, but work is not to be started immediately. The Tennessee company also changed Ensley No. 1 and No. 3 from basic to foundry, as a result of the closing down of the Ensley rail mill. After being on foundry for one week, the Gulf States Steel stack at Alabama City was changed back to basic. Fourteen furnaces are now in blast in Alabama, five on basic and nine on foundry. There has been a reduction in active furnaces during the month of three.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.50
No. 1 fdy., 2.25 to 2.75 sil.	15.00
Basic	14.50

Finished Steel. — New tonnage in structural shapes, plates, bars, sheets and miscellaneous lines continues at the high level of the past few months, with an increase shown in sheets. There is very little rail tonnage left on the books of the Tennessee company and its Ensley rail mill was closed down last week. The remaining business is being handled by the small Fairfield mill. New business of the structural steel and bar fabricators consisted only of small orders, with the exception of the structural steel contract for the new plant of the Brown Paper Mill Co., at Monroe, La., amounting to 2000 tons and secured by the Virginia Bridge & Iron Co. With the closing of the rail mill at Ensley, the Tennessee company decreased open-hearth operations to three of nine furnaces. Seven out of eight open-hearths are being run at Fairfield. The Gulf States Steel Co. has all six of its open-hearths at Alabama City in operation.

Cast Iron Pipe. — Pressure pipe manufacturers report only a fair amount of routine business, with no

large orders during the last week. One company accumulated about 2000 tons, while another ran slightly ahead of that figure. Shipments continue at a rate equaling production. Prices remain at $37 to $38 a net ton, Birmingham, for 6-in. and larger diameters.

Coke.—There is very little new business in foundry coke. Movement on contract is steady and ahead of that at this time last year. Quotations remain at $5 for both spot and contract.

Old Material.—The gradual improvement of the past several weeks is being maintained and the outlook is better than at any other time since early spring. There have been no changes in quotations since two weeks ago, when a number of grades advanced.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to $13.50
Scrap steel rails	14.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	$11.50 to 12.00
Steel axles	21.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	15.50
No. 1 cast	13.50
Tramcar wheels	13.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

St. Louis

Steel Plant Buys 10,000 Tons of Southern Basic—Scrap Scarcity Strengthens Market

ST. LOUIS, Aug. 27.—The sale of 10,000 tons of Southern basic iron to a Peoria melter was the outstanding development in the pig iron situation in this district during the week. The buyer, the Keystone Steel & Wire Co., has heretofore used no iron of this description, and the purchase was made for use as a substitute for scrap, which is scarce and expensive. Sales otherwise consisted of foundry and malleable grades, totaling about 4000 tons, divided between Northern and Southern iron. Leading users are well supplied, but the smaller concerns are holding off, and still have considerable buying to do for the rest of the year. Prices remain uneven. The Southern basic sold is believed to have gone at a price figuring below $13, furnace. The melt holds up well and shipments continue in good volume.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$19.50 to $20.00
Malleable, f.o.b. Granite City	20.50
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	$16.92 to 18.92
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel.—Numerous small lots of reinforcing concrete bars are being taken, mainly for road and river improvement work. The only letting of size was 1600 tons for a storage sewage disposal plant at Peoria, Ill., to the Laclede Steel Co. Warehouse business is fairly active, with a better demand than heretofore for fencing, roofing and the lines used in the rural areas. Makers and distributers of sheets report satisfactory conditions. The leading district producer is operating all sections at capacity. Specifying by car and automobile builders has tapered off.

Coke.—Deliveries of metallurgical coke on contract are in considerable volume, reflecting a melt of greater than ordinary seasonal proportions. New buying, however, lags, and is confined to immediate needs. A slight revival in domestic sizes has been noted since Aug. 15. Demand for industrial grades is about normal for this time of year. Prices are unchanged.

Old Material. — Strength marks scrap iron and steel in this district. There is a scarcity of material, most pronounced in steel works scrap. Steel grades are wanted and are difficult to obtain at prices the mills are willing to offer. Yard stocks are not of sufficient size to alleviate the situation and arrivals from the country are light. The carriers, much preoccupied with a grain movement of record size, have neither time nor facilities to increase their old material deliveries. Interest is being taken in malleable grades, and a slightly firmer tone prevails in cast items than heretofore. Railroad lists before the trade include: Nashville, Chattanooga & St. Louis, 13 cars; Pullman Co., 1 car; Union Pacific, 3900 tons; Nickel Plate, 54 cars; Frisco, 71 cars; Chicago, Milwaukee, St. Paul & Pacific, 127 cars, and Chicago & Eastern Illinois, 6 cars.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$14.75 to $15.25
No. 2 heavy melting or shoveling steel	14.50 to 15.00
No. 1 locomotive tires	15.00 to 15.50
Miscel. stand.-sec. rails including frogs, switches and guards, cut apart	17.00 to 17.50
Railroad springs	19.00 to 19.50
Bundled sheets	10.50 to 11.00
No. 2 railroad wrought	15.00 to 15.50
No. 1 busheling	10.00 to 10.50
Cast iron borings and shoveling turnings	9.50 to 10.00
Iron rails	15.00 to 15.50
Rails for rolling	17.25 to 17.75
Machine shop turnings	7.00 to 7.50
Heavy turnings	10.00 to 10.50
Steel car axles	19.50 to 20.00
Iron car axles	26.50 to 27.00
Wrot. iron bars and trans.	21.50 to 22.00
No. 1 railroad wrought	13.75 to 14.25
Steel rails, less than 3 ft.	18.00 to 18.50
Steel angle bars	15.25 to 15.75
Cast iron carwheels	15.00 to 15.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	15.50 to 16.00
No. 1 railroad cast	14.75 to 15.25
Stove plate	12.50 to 13.00
Agricult. malleable	15.25 to 15.75
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shaftings, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	5.10c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	5.15c.
Structural rivets	3.95c.
Boiler rivets	3.95c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

Buffalo

Boat Shipments of Pig Iron Going to Chicago and Detroit—Steel Mills Maintain High Output

BUFFALO, Aug. 27.—The pig iron market continues strong, with considerable booking of small lots, principally for the fourth quarter. Buffalo producers are shipping a good deal of iron to Chicago and Detroit, where they have little difficulty in realizing a price equivalent to $18.50, Buffalo, for No. 2 plain. The westward shipments are being made by boat. The General Electric Co. is in the market for 500 tons of No. 1 foundry for its Schenectady plant and the New York Air Brake Co., which had been in the market for 500 tons of foundry and malleable, has covered for part of its requirements for its Watertown plant. One inquiry for basic has been received from the East and is for 2,000 to 3,000 tons. Most of the business taken in the East is at a minimum of $18, with $18.50 applying on much of it.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$19.50
No. 2X fdy., sil. 2.25 to 2.75	20.00
No. 1 fdy., sil. 2.75 to 3.25	21.00
Malleable, sil. up to 2.25	20.00
Basic	18.50
Lake Superior charcoal	27.25

Finished Iron and Steel.—Operations of local steel mills continue at an unchanged pace, and demand for all lines is good. The General Electric Co. has awarded 3,000 tons for a new powerhouse at Tonawanda, N. Y., and the State has let 200 tons for a new cell building at Auburn prison, Auburn, N. Y. Bates & Rogers are low on the general con-

tract for a viaduct over the New York Central tracks at Harlem avenue, Buffalo, which will require 200 to 300 tons of reinforcing bars and 300 tons of structural steel. School No. 67, Buffalo, calls for 600 tons of structural steel and 150 tons of reinforcing bars. A considerable volume of small reinforcing bar business has been placed.

Old Material. — There is little change in the market, though some disposition to spottiness has developed. Dealers are expecting momentarily an increased demand for No. 1 machinery cast and stove plate, which may be quite apparent by Sept. 1. Dealers are paying up to $17.75 against a recent order of No. 1 heavy melting steel taken at $18, and it develops that an order of No. 1 heavy melting steel was placed at $17 shortly after the $18 purchase, at a plant where inspections give the dealers slightly more leeway. Some sales of cast iron borings are reported at the current quotations. The demand for specialties has improved, and sales of short rails at $19.50 and railroad knuckles and couplers at $19.50 are reported. The market for machine shop turnings has strengthened, with sales reported at $9 to $9.50.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$17.50 to $18.00
No. 2 heavy melting steel	14.75 to 15.00
Scrap rails	16.50 to 17.00
Hydraul. comp. sheets	14.50 to 14.75
Hand bundled sheets	12.00 to 12.50
Drop forge flashings	14.25 to 14.50
No. 1 busheling	15.50 to 16.50
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	9.00 to 9.50
No. 1 railroad wrought	13.00 to 13.50
Acid Open-Hearth Grades:	
Knuckles and couplers	19.50 to 19.75
Coil and leaf springs	19.00 to 19.50
Rolled steel wheels	19.00 to 19.50
Low phos. billet and bloom ends	20.00 to 20.50
Electric Furnace Grades:	
Short shov. steel turnings	12.00 to 12.50
Blast Furnace Grades:	
Short mixed borings and turnings	10.50 to 11.50
Cast iron borings	10.50 to 11.50
No. 2 busheling	10.00 to 10.50
Rolling Mill Grades:	
Steel car axles	18.75 to 19.25
Iron axles	21.00 to 22.00
Cupola Grades:	
No. 1 machinery cast	16.00 to 17.00
Stove plate	13.00 to 13.50
Locomotive grate bars	12.50 to 13.00
Steel rails, 3 ft. and under	19.50 to 19.75
Cast iron carwheels	14.00 to 14.50
Malleable Grades:	
Industrial	18.00 to 18.50
Railroad	18.00 to 18.50
Agricultural	18.00 to 18.50
Special Grades:	
Chemical borings	12.50 to 13.50

Warehouse Prices, f.o.b. Buffalo

	Base per Lb
Plates and struc. shapes	3.40c
Soft steel bars	3.30c
Reinforcing bars	2.95c
Cold-fin. flats, sq. and hex. Rounds	4.45c 3.95c
Cold-rolled strip steel	5.85c
Black sheets (No. 24)	4.20c
Galv. sheets (No. 24)	4.85c
Blue ann'l'd sheets (No. 10)	3.50c
Com. wire nails, base per keg	$3.60
Black wire, base per 100 lb.	3.75

Boston

Buffalo Pig Iron Now at $17 to $18 Range—Scrap Prices Firmer—Coke Shipments Heavy

BOSTON, Aug. 27.—Pig iron sales the past week ran close to 6000 tons. The largest transaction was 1000 tons of No. 2X and No. 1X to a Massachusetts textile machinery manufacturer by the Mystic Iron Works. Most of the business otherwise was in small tonnages, with Connecticut foundries the principal buyers. Third quarter contracting is virtually over, and quite a few foundries are covered for fourth quarter. A Massachusetts textile machinery maker is in the market for an indefinite tonnage, but probably will purchase about 2000 tons. There are no other open inquiries of size. Southern iron is still available at $14 a ton, base furnace. One Buffalo stack has accepted business at $17 a ton, base furnace, but others in that district maintain a base price of $18 a ton. No. 2X Indian iron is available at $21.75 to $22 a ton, on dock here, duty paid. All recent sales except one made by the Everett, Mass., furnace were at $20 to about $22 a ton, furnace, for No. 2X and No. 1X. The exception was a small tonnage of No. 2X at $19.50 a ton, furnace, on a high freight and in active competition.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$21.28 to $22.28
†Buffalo, sil. 2.25 to 2.75	21.78 to 22.78
*Buffalo, sil. 1.75 to 2.25	21.91 to 22.91
*Buffalo, sil. 2.25 to 2.75	22.41 to 23.41
East. Penn., sil. 1.75 to 2.25	22.65 to 23.15
East. Penn., sil. 2.25 to 2.75	23.15 to 23.65
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	23.61
*Ala., sil. 2.25 to 2.75	24.11
†Ala., sil. 1.75 to 2.25	19.75 to 20.25
†Ala., sil. 2.25 to 2.75	20.25 to 20.75

Freight rates: $4.91 all rail from Buffalo, and $4.28 rail and water; $3.65 all rail from eastern Pennsylvania; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Reinforcing Steel.—The sale of 300 tons of billet steel bars for a Waltham, Mass., hospital and a grist of smaller tonnages brought New England sales the past week up to about 1000 tons, the largest amount in any similar period in a long time. About 1500 tons in large and small jobs is pending. With the speeding up of business there is less inclination to make price concessions, particularly on lots of less than 100 tons, and 2.66½c. a lb., base, from stock prevails. The market for rail steel bars is a little more active, with 2.26½c. a lb., base, delivered common Boston freight rate points, the openly quoted price.

Cast Iron Pipe.—The only open municipal business in sight is 1½ miles of 6, 8, 10 and 12-in. pipe for Putnam, Conn. Private business is holding up well. Prices quoted openly on domestic pipe are: 4-in., $46.10 to $47.10 a ton, delivered common Boston freight rate points; 6 to 12-in., $40.10 to $41.10; 16 to 20-in., $39.10. A $3 differential is asked on Class A and gas pipe.

Warehouse Business. — The closing days of August have brought a rather pronounced betterment in the movement of iron and steel and kindred products out of warehouses. Wire nails have been reduced 10c. to $3.40 per keg, base, out of warehouse, and to $2.65 per keg, base Pittsburgh, on direct mill shipments. This reduction, according to warehouses, is confined to Atlantic seaboard points and is due to the influx of German nails at Boston and elsewhere.

Coke.—Specifications against last half by-product foundry coke contracts have materially stepped up, and indications are that August billings will be exceptionally large for a midsummer month. The price remains at $11 a ton, delivered within a $3.10 freight rate zone. The New England Coal & Coke Co's. 1929 domestic coke sales will be far in excess of those for any previous year in the history of the company. The Providence Gas Co. expects to have its new battery of 25 ovens in operation by Dec. 1, next, which will about double its coke supply.

Old Material.—Old material prices are firmer than a week ago, but with one exception no higher, although outside quotations are being paid by brokers more often than inside. Numerous sales of steel turnings at $7.50 a ton, on cars shipping point, are reported, whereas a week ago $7.25 was the top price. While No. 1 heavy melting steel transactions the past week were within a range of $12.25 to $12.75 a ton, most business was at $12.50 to $12.75, with $12.75

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

predominating. The long bundled skeleton market is quite active for Worcester, Mass., consumption. Although by no means active, the market for specification pipe is more so than it has been the past two months. There is also quite an improvement in the demand for No. 1 railroad wrought at $11 a ton, on cars shipping point. New England foundries are buying larger quantities of machinery cast, but largely from local or nearby yards. During the next six weeks the United Electric Railway Co., Providence, R. I., will produce about one car a day of scrap metal from obsolete trolley cars, in addition to steel wheels, axles, trolley stands and other equipment.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$12.25 to $12.75
Scrap T rails	11.50 to 12.00
Scrap girder rails	10.50 to 11.00
No. 1 railroad wrought	11.00 to 11.50
No. 1 yard wrought	9.00 to 9.50
Machine shop turnings	7.00 to 7.50
Cast iron borings (steel works and rolling mill)	6.50 to 6.75
Bundled skeleton, long	10.00 to 10.50
Forge flashings	10.50 to 10.75
Blast furnace borings and turnings	6.00 to 6.25
Forge scrap	9.00 to 9.25
Shafting	14.00 to 14.75
Steel car axles	18.00 to 18.50
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.75 to 10.00
Rails for rolling	12.50 to 13.00
Cast iron borings, chemical	9.75 to 10.00

Prices per gross ton deliv'd consumers' yards:

Textile cast	$14.00 to $14.50
No. 1 machinery cast	15.00 to 15.25
No. 2 machinery cast	13.00 to 13.25
Stove plate	11.00 to 11.50
Railroad malleable	18.00 to 18.50

Detroit

August Auto Output May Exceed July's

DETROIT, Aug. 27. — Automotive production apparently will be slightly larger in August than in July and should be better than the volume of August, 1928. The Ford Motor Co. and Chevrolet Motor Co. are proceeding at high production rates. The Ford Motor Co. is understood to have about 200,000 unfilled orders for the current month.

According to H. G. Klinger, vice-president and general sales manager of the Chevrolet Motor Co., the sales quota set for the period of Sept. 1 to Jan. 1 is 300,000 units.

There have been no changes in scrap prices during the past week. The market is firm and sales in small tonnages bring the top of the range.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$14.25 to $14.75
Borings and short turnings	9.00 to 9.50
Long turnings	8.50 to 9.00
No. 1 machinery cast	12.50 to 13.00
Automobile cast	13.00 to 13.50
Hydraul. comp. sheets	14.00 to 14.50
Stove plate	9.00 to 9.50
New No. 1 busheling	12.50 to 13.00
Old No. 1 busheling	11.00 to 11.50
Sheet clippings	8.75 to 9.25
Flashings	13.00 to 13.50

Cincinnati

Southern Pig Iron Weakness Does Not Affect Northern Iron—Sheet Orders Equal 80 Per Cent of Shipments

CINCINNATI, Aug. 27.—With most of the district consumers of pig iron apparently covered for the third quarter, sales of pig iron during the past week were slightly below those of the preceding week. Total sales were around 6000 tons, of which about 1000 tons was Southern iron. Sales of Southern iron gave further opportunity to test Southern prices here, and indicated that the market is about $13.50 to $14, base Birmingham, although price uncertainty still indicates a weak market. Reports that the Republic Iron & Steel Co. is booked for the remainder of this year and that other furnaces have cut surplus stocks helped to allay some of the apprehensions regarding the Southern situation. Recent sales of Northern iron indicate that the market is well established at about $18.50, base Valley Furnace, and virtually no concessions are being granted. A Mansfield, Ohio, consumer is inquiring for 350 tons of malleable iron and a Huntington, W. Va., melter is asking for 200 tons of Northern foundry.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	17.19 to 18.19
Ala. fdy., sil. 2.25 to 2.75	17.69 to 18.69
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 18.19
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Material.—A slight recession of the demand for sheets last week was reported by district sheet mills. With mills maintaining capacity production, backlogs were reduced. In fact, the leading interest in this district indicates that backlogs are being cut at the rate of about 2000 tons a week and fresh bookings during the past week were about equal to 80 per cent of output. Although the demand for galvanized sheets is fairly brisk, the market is affected by reports of price concessions in the South. It is said that business has been placed at $3.35, Birmingham, as against the usual formal quotation of $3.75.

Coke.—Specifications of by-product foundry coke slackened slightly during the past week, although consumers have taken coke on contract at a good rate for August. While prices on foundry by-product coke will continue at about $10.05, delivered in Cincinnati, during September, quotations on domestic grades will be increased 25c. a ton on Sept. 1.

Old Material—The continued difficulty dealers have in obtaining sufficient good scrap to cover commitments is contributing strength to the old material market, but the reluctance of mills to pay higher prices has halted increases by dealers. There is very little buying, although consumers are accepting shipments on contract. Yard stocks of the steel grades are nearly depleted, and the only accumulation of old materials is in the cast iron grades.

Dealers' buying prices per gross ton, f.o.b cars, Cincinnati:

Heavy melting steel	$14.25 to $14.75
Scrap rails for melting	14.25 to 14.75
Loose sheet clippings	9.00 to 9.50
Bundled sheets	11.00 to 11.50
Cast iron borings	9.25 to 9.75
Machine shop turnings	8.50 to 8.75
No. 1 busheling	10.50 to 11.00
No. 2 busheling	7.00 to 7.50
Rails for rolling	14.50 to 15.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	14.25 to 14.75
Short rails	18.50 to 19.00
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	19.00 to 19.50
No. 1 railroad cast	15.25 to 15.75
Burnt cast	10.25 to 10.75
Stove plate	10.25 to 10.75
Brake shoes	10.25 to 10.75
Agricultural malleable	14.25 to 14.75
Railroad malleable	15.25 to 15.75

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex.	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	3.85c.
Small rivets	65 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb.	8.75
	Net per 100 Ft.
Lap-weld steel boiler tubes, 2-in.	$16.00
4-in.	33.00
Seamless steel boiler tubes, 2-in.	17.00
4-in.	34.00

Youngstown

Production in Mahoning Valley Turns Upward

YOUNGSTOWN, Aug. 27.—Iron and steel production takes an upturn this week in the Mahoning Valley, showing a gain of two open-hearth furnaces.

The Mahoning Valley Steel Co. has started eight sheet mills at its Niles plant, bringing the total number of active units in the district to 113 out of 120, against 97 in the preceding week. Of 51 independent open-hearth furnaces, 46 are active.

Rolling mills will suspend next Monday for the Labor Day observance.

Steel operations average 85 per cent this week. The Sharon Steel Hoop Co. has one strip mill off and is operating its steel plant at Lowellville at 80 per cent. The Republic Iron & Steel Co. is operating all four of its blast furnaces in its Haselton group. Twenty-eight of the district's 34 stacks are in blast.

Structural Steel Orders Heavy in July

WASHINGTON, Aug. 23.—Orders for fabricated structural steel in July, reported to the Department of Commerce by 193 firms, totaled 277,119 tons, representing 91 per cent of their capacity of 302,990 tons. This compares with 279,729 tons in June, reported by 218 firms, representing 89 per cent of their capacity of 312,885 tons.

Computed orders in July were 350,350 tons, against 342,650 tons, and computed shipments were 304,150 tons, or 79 per cent of capacity, compared with 292,600 tons or 76 per cent. July orders were the largest, with the exception of March, for any month this year, and were exceeded only once (August) last year.

For the first seven months of the current year computed orders totaled 2,271,500 tons, against 1,867,250 tons for the like period of last year. Computed shipments were 2,009,700 tons, or 75 per cent of capacity, against 1,690,150 tons, or 63 per cent of capacity, last year.

Newton's Michigan Mill Ready in January

The Newton Steel Co. is now roofing the buildings for its new plant at Monroe, Mich., which will consist of eight sheet mills designed to produce high finished automobile stock. The plant will have capacity for 20,000 tons of sheets monthly, about the same as its plant at Newton Falls, Ohio. It is expected the plant will be ready for experimental rolling in December and for commercial production in January.

Doubt Special Session Will Pass Tariff Bill

WASHINGTON, Aug. 27.—With the administrative features drafted, the Senate Committee on Finance has now finished revising the House tariff bill and the measure will come up for consideration in the Senate on Sept. 4, according to present plans. Like all tariff measures it is to be bitterly contested and there appears to be the general view that it will not pass at the special session.

Indications that some of the Republican leaders share this opinion is the statement given out last week by Senator Watson of Indiana, majority leader, that the bill must be passed by the first of the year. Previously Senator Watson had expressed the opinion that the bill would be passed at the special session, and apparently there are some who still think this may be done.

Much discussion has centered around the placing of manganese ore on the free list and despite the comparative obscurity of the item so far as the general public is concerned, it appears to be getting a political importance that had hardly been anticipated. Apparently but little notice has been given to the fact that the Senate Committee in making manganese duty free reduced the duty on virtually all important iron and steel products and some of their remanufactures. The assumption is that if manganese ore should be restored to the dutiable list by the Senate, the stated reduction in rates on steel also would be removed.

Chairman Smoot of the Finance Committee estimated that the average ad valorem rate in the metal schedule of the Committee bill is 34.76 per cent and that its revenue would be $42,848,180 annually as against an average ad valorem rate of 39.63 per cent, netting $51,535,850 in the House bill and an average ad valorem rate of 35.07 per cent, netting $45,603,592, in the present Fordney-McCumber act. He said that 51 changes were made in the metal schedule.

In its report last week THE IRON AGE stated that the Senate Committee reduced the duty on punches, shears and bar cutters to 35 per cent from the duty of 40 per cent carried in the House bill. The Senate Committee reduced the rate to 30 per cent.

Sheet Steel Sales Gain in July

Sales of steel sheets by independent mills gained 10 per cent in July over June and production and shipments showed only a slight decline from the previous month according to the monthly report of the National Association of Flat Rolled Steel Manufacturers. However, production and shipments in June were considerably below the peak attained in May. Sales during the month were only about 7000 tons less than shipments. Unfilled orders are still heavy although they have declined each month since the peak of 835,801 tons in April. The July report and comparisons, in net tons, follow:

	July	June	May
Total number of mills	723	722	722
Capacity per month, tons	486,430	451,125	502,600
Percentage reporting	67.9	67.8	67.6
Sales, tons	337,222	307,911	279,783
Production	323,905	337,841	393,430
Shipments	344,676	347,989	392,336
Unfilled orders	658,155	676,568	713,568
Unshipped orders	107,751	111,333	119,535
Unsold stocks	47,103	52,274	48,334
Percentages of Capacity			
Sales	102.2	100.6	82.4
Production	98.1	110.4	115.8
Shipments	104.4	113.7	115.5
Unfilled orders	199.4	221.1	210.1
Unshipped orders	32.6	36.4	35.2
Unsold stocks	14.3	17.1	14.2

Laclede Builds Tube Mill

The Laclede Steel Co., St. Louis, has broken ground for a tube mill on a site adjacent to its steel works at Alton, Ill. Steel pipe will be made to serve the St. Louis district and the Southwest.

Higher British Tool Steel Prices Expected

LONDON, ENGLAND, Aug. 19.—It is probable that prices of high-speed tool steels will increase owing to the recent rapid advance in the prices of tungsten, according to the *Commercial*. When the metal-working trades last year were consuming relatively little tool steel, ferrotungsten fell to 30c. a lb., and tungsten powder to 36c. When ferrotungsten is, say, 30c. per lb., wolfram ore from which it is made is worth $75 per ton. The slump in tungsten caused the closing of many of the wolfram ore mines in Burma.

In pre-war days German interests owned tne major supplies of wolfram ore, but during the war period British steel interests, mainly those at Sheffield, became the owners of the wolfram ore mines in Burma. It remains to be seen how far it is necessary to increase output to meet the needs of the tungsten works at Widnes and those of the makers of British tool steels.

Austin Co. to Build Russian Automobile Plant

The Austin Co., Cleveland, has received official confirmation of the recently published report that it has been awarded a contract for the design and construction of an automobile plant for the Soviet Government at Nishni Novgorod, Russia. The plant will be designed to manufacture 100,000 Ford cars annually and the Ford Motor Co. will provide technical assistance in equipping the plant and will assist in the manufacturing operations when the factory is completed. The project involves an expenditure of $20,000,000. The engineering work will be handled in the main office of the Austin Co. in Cleveland.

The contract calls for a power house, foundry and complete automobile plant, which will cover a 5,000 acre site. Housing will be provided for 25,000 people. The works will be erected by Soviet labor under the direction of American construction engineers. Upon completion of the designing and engineering details of the project, the Austin Co. will send a staff of experts to Russia to start the work of actual construction. The plant is scheduled to be completed in about two years.

Ohio Foundries Operate at Over Capacity Rate

Ohio foundries operated at 105.3 per cent during July, a slight falling off from June when their operations were at the rate of 110.6 per cent, according to the monthly report of the Ohio Foundries Association, Inc., based on data supplied by 32 foundries. Operations during July, 1928, were 103 per cent of capacity.

Non-Ferrous Metal Markets

Copper More Active—Tin Very Dull—Lead Sales Larger —Zinc Firm—All Prices Steady

NEW YORK, Aug. 27.

Copper.—Demand from both domestic and foreign consumers is increasing and the market is gathering strength almost every day. Yesterday, in particular, sales to domestic consumers exceeded 7500 net tons, and the market was quite active today. Buying is largely for September delivery, but there has already appeared some October demand, which has been covered. It is estimated that domestic consumers have bought close to 65 per cent of their September requirements. There are also some sales each day for immediate shipment. Foreign buying has increased, with the average for the last few days approximating 2000 to 3000 gross tons a day. Conservative calculations place the foreign sales for this month at about 45,000 tons, as compared with 21,000 tons two weeks ago, and with average normal purchases of at least 50,000 tons monthly. Foreign buyers have purchased only about 35 per cent of their September needs. In general, the buying is broad, including wire makers, brass producers and miscellaneous melters. On Monday one producer's sales ranged from 50,000 lb. up to over 2000 tons in single transactions. There is no change in prices, which are firm at 18c., delivered in the Connecticut Valley for electrolytic copper. The quotation of Copper Exporters, Inc., is 18.30c. c.i.f., usual European ports. Lake copper, particularly for spot and nearby delivery, is in active demand. One producer sold 500,000 lb. Monday. Prices are unchanged at 18c. to 18.12½c., delivered.

Tin.—In a very quiet market, sales of spot Straits tin for the week ended Saturday, Aug. 24, were about 700 tons. The market is devoid of features. Transactions have been almost entirely for spot and early September delivery and they are made by consumers who do not usually buy far ahead. In London, the market is also very quiet. Price fluctuations are small and therefore the so-called group has neither to buy nor sell to stabilize the market. Sales in the Far East, which are in fair volume, are at full prices. Very little activity is looked for from now on until after Labor Day. Spot Straits tin today

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	Aug. 27	Aug. 26	Aug. 24	Aug. 23	Aug. 22	Aug. 21
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	46.12½	46.37½	....	46.75	46.62½	46.37½
Zinc, East St. Louis	6.80	6.80	6.80	6.80	6.80	6.80
Zinc, New York	7.15	7.15	7.15	7.15	7.15	7.15
Lead, St. Louis	6.55	6.55	6.55	6.55	6.55	6.55
Lead, New York	6.75	6.75	6.75	6.75	6.75	6.75

*Refinery quotation; price ½c. higher delivered in the Connecticut Valley.

Rolled Products

Prices on rolled non-ferrous products are unchanged from those prevailing one week ago.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.25c.
- Lead (full sheets) ... 11.00c. to 11.25c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 33.00c.
Tubes, base ..... 42.00c.
Machine rods ..... 34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	11.35c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass	21.12½c. to 22.12½c.
Copper, hot rolled, base sizes	27.75c. to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c. to 31.00c.
Seamless Tubes—	
Brass	26.00c. to 27.00c.
Copper	29.12½c. to 30.12½c.
Brazed Brass Tubes	29.12½c. to 30.12½c.
Brass Rods	18.87½c. to 19.87½c.

New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks	10.50c. to 11.00c.
Zinc sheets, open	11.50c. to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	48.00c. to 49.00c.
Tin, bar	50.50c. to 51.50c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	7.75c. to 8.25c.
Lead, American pig	7.50c. to 8.00c.
Lead, bar	9.50c. to 10.00c.
Antimony, Asiatic	10.75c. to 11.25c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	30.25c. to 31.25c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	51.75c.
Tin, bar	53.75c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	7.75c. to 8.00c.
Lead, American pig	7.25c. to 7.50c.
Lead, bar	9.75c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	18.75c.
Babbitt metal, high grade	56.00c.
Solder, ½ and ½	31.75c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.75c.	16.25c.
Copper, hvy. and wire	14.50c.	15.75c.
Copper, light and bottoms	12.50c.	13.75c.
Brass, heavy	8.50c.	9.50c.
Brass, light	7.50c.	8.50c.
Hvy. machine composition	12.00c.	13.00c.
No. 1 yel. brass turnings	9.75c.	10.50c.
No. 1 red brass or compos. turnings	11.25c.	12.25c.
Lead, heavy	5.25c.	5.75c.
Lead, tea	4.25c.	5.25c.
Zinc	3.50c.	4.25c.
Sheet aluminum	14.00c.	16.00c.
Cast aluminum	12.25c.	14.25c.

was quoted at 46.12½c., New York. London prices today were a little lower than a week ago with spot standard quoted at £208 7s. 6d., future standard at £212 7s. 6d., and spot Straits at £212 7s. 6d. The Singapore price today is £217 10s.

Lead. — A considerably stronger market has developed. Sales have increased in volume and some fairly large transactions are reported. Delivery involved in some cases includes October, with some inquiry appearing for November, but most of the demand is for nearby and September. Prices are unchanged, that of the leading interest in the West standing at 6.55c., St. Louis. The leading interest continues to quote 6.75c., New York, as its contract price.

Zinc.—A better demand is reported, with a consequently firmer market. A week ago some shading of the quotation of most sellers was heard of, but this has disappeared. Demand for spot is better than for futures. There has, however, been no change in quotations, which continue at 6.80c., East St. Louis, or 7.15c., New York. Ore is still selling at $44 a ton, Joplin. Sales for the week ended Saturday, Aug. 24, were smaller than the previous week at 10,930 tons. Shipments, however, were the largest since April at over 13,200 tons, about the same as the production for the week, estimated at 13,550 tons. Reports are that efforts are being made to shut down the mines the week of Labor Day.

Antimony. — Conditions continue about the same as a week ago. Demand is more active and prices are very firm, owing partly to the prospect of an increase in the duty. Chinese metal is quoted and sold at 9c. a lb., New York, duty paid, for spot and nearby delivery, with futures at 8.87½c.

Nickel.—In wholesale lots, ingot nickel is quoted at 35c. a lb., with shot nickel at 36c. and cathode electrolytic nickel at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published quotation of 23.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

Aug. 27.—There has been a considerable increase in interest in all the metals, with business generally in somewhat better volume. Tin has declined to 47½c., but the other metals are unchanged. Old metal prices are unaltered.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 47.40c.; lead, 6.70c.; zinc, 6.87½c.; in less-than-carload lots, antimony, 9.85c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.50c.; zinc, 3.25c.; pewter, No. 1, 24.50c.; tin foil, 26c.; block tin, 36c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

OBITUARY

DR. JEREMIAH W. JENKS, research professor of government at New York University and president of the Alexander Hamilton Institute, died in New York, Aug. 24, aged 72 years. He graduated from the University of Michigan, studied law and was admitted to the bar but later became a teacher, being appointed in 1885 to the chair of political science at Knox College, Illinois. Later came professorships in Indiana University, Cornell, and New York University. He frequently served on Federal commissions dealing with economic questions. From 1889 to 1901 he was expert agent of the United States Industrial Commission charged with investigating trusts and industrial combinations in the United States and Europe. He acted in 1903 in the interest of the Mexican and Chinese Governments in their effort to secure the cooperation of the United States in establishing a fixed relationship between the money of gold standard and silver using countries. He was an authority on Oriental affairs and an official adviser and firm friend of the Chinese. In 1922 he investigated economic conditions in Germany to aid the Government in stabilizing the mark. He wrote a number of books on economic, educational and social questions and many Government reports on labor, finance and industry. He will be remembered as a friend of youth who gladly served his day and labored in season and out of season for betterment in government, in business and in the lives of every-day men and women.

GEORGE W. THOMSON, for many years Chicago district manager of the Norton Co., died Aug. 22, following a short illness. He was born in Fall River, Mass., 50 years ago. He was 12 years old when the family moved to Worcester, Mass., and a few years later went to work for the Norton Co. In 1910 he was assigned to the sales department covering Connecticut, and later Philadelphia.

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WALTER A. WINDSOR, president, Marietta Mfg. Co., Point Pleasant, W. Va., manufacturer of steel barges, died on Aug. 20 in a Cincinnati hospital, following an operation. He was born at Marietta, Ohio, 40 years ago, and entered the business of which his father was the head, soon after his graduation from Marietta College. During his presidency the plant of the company was removed from Marietta to Point Pleasant, and became one of the leading barge builders on the lower river. Mr. Windsor was also president of the Point Pleasant and Gallipolis Bridge Co., and of the Citizens National Bank, Point Pleasant.

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JOHN J. THEOBALD, for many years superintendent of the Spencer, Mass., plant of the Wickwire Spencer Steel Corporation, and for the past six years retired, died suddenly on Aug. 20, while attending the funeral of a friend in Spencer. He had served as president of the Spencer Chamber of Commerce and was a trustee of the Spencer Savings Bank.

Further Decrease in Imports of Pig Iron

Imports of pig iron into the United States in July dropped to 6743 gross tons from 11,396 tons in June and 14,393 tons in May. The July figures, however, were more than 10 per cent higher than a year ago, when 6055 tons came in.

For the seven elapsed months of the calendar year incoming tonnages have been within 2 per cent of the corresponding total last year. There has been only a slight change in the line-up of the supplying countries, British India having replaced United Kingdom in the lead, with the Netherlands, as last year, in third place.

UNITED STATES IMPORTS OF PIG IRON BY COUNTRIES OF SHIPMENT
(In Gross Tons)

	July		Seven Months Ended July	
	1929	1928	1929	1928
United Kingdom	412	50	27,284	34,777
British India	5,120	2,994	30,559	26,774
Germany	....	....	103	95
Netherlands	818	2,325	18,292	15,840
Canada	54	....	525	378
France	....	300	101	300
Belgium	....	....	184	202
Norway	....	....	1,340	91
Sweden	306	355	1,309	1,396
All others	33	31	507	1,497
Total	6,743	6,055	80,204	81,350

The Weaver Brothers Co., Adrian, Mich., has been made sales representatives in the metal pickling field for the Johnson-Carlson Tank Co., Chicago, manufacturer of wood tanks.

PERSONAL

K. L. GRIFFITH has been elected president of the Seneca Iron & Steel Co., Buffalo, succeeding Hugh Kennedy, deceased. JAMES PATERSON and CLIFFORD HUBBELL were elected vice-presidents, ALEX PATERSON and T. W. PATERSON, treasurer and secretary, respectively.

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S. S. FOX has been made manager and W. R. COLLARD, assistant manager of the Detroit office of the Joseph Schonthal Co., Columbus, Ohio.

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J. J. BRADY has been appointed district manager of the Boston office of the Combustion Engineering Corporation, New York, and M. E. YEAGER, sales engineer. The company's New England representation through the Schumaker-Santry Co. has been discontinued.

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F. L. FARRELL and D. F. JONES, formerly of the Schumaker-Santry Co., Boston, have associated themsevles as Farrell & Jones, 10 High Street, Boston, and have taken over the accounts formerly handled by Schumaker-Santry Co.

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THOMAS L. THOMAS, formerly of the McKay Machine Co., has joined the Youngstown Foundry & Machine Co., Youngstown, Ohio, as manager of the machine department, and takes charge of production and sales. The company manufactures shears, roll lathes, spike machines and sheet mill equipment and will soon extend the latter line.

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DR. OTTO PETERSEN, managing director of the Verein deutscher Eisenhüttenleute, Düsseldorf, Germany, and editor of *Stahl und Eisen*, will arrive in New York, Sept. 2, aboard the steamer New York to spend a short time in the United States en route to the Engineering Congress in Japan this fall.

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I. F. BAKER has been appointed European sales manager of the Westinghouse Electric International Co., with headquarters at 2 Norfolk Street, Strand, London. He has been sales manager of the power division of the company in New York, and during his connection with the Westinghouse company, which began in 1909, he has served in the export sales department of the parent company, as Japanese manager for the International company, and as managing director of the company's Japanese subsidiary.

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B. F. PIERSON, for many years with the Boston office of Niles-Bement-Pond Co., has joined the sales force of Manning, Maxwell & Moore.

WILLIAM J. WALSH, founder and president of the Walsh Holyoke Steam Boiler Works, Inc., Holyoke, Mass., has relinquished his activities in the business other than in an advisory capacity. He is succeeded by W. BRUCE PIRNIE, Springfield, Mass., a director of the Cheney-Bigelow Wire Co., and president of the Pirnie-Simmons Co. C. E. HEYWOOD and VINCENT P. MARRIN will continue as treasurer and assistant treasurer, respectively, of the boiler company.

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F. J. MUELLER, general foreman of the core department, Hammond, (Ind.) works, American Steel Foundries, has been appointed assistant works manager at the Indiana Harbor, Ind., plant.

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WILLIAM A. FORBES, assistant to president, United States Steel Corporation, New York; CHIH-HUNG CHOW, metallurgist, Lorain works, National Tube Co.; LEONARD C. GRIMSHAW, assistant metallurgist, Ludlum Steel Co., Watervliet, N. Y.; WALTER G. HILDORF, metallurgical engineer, Timken Roller Bearing Co. and Timken Steel & Tube Co., Canton, Ohio; SAMUEL R. ROBINSON, foundry manager, Industrial Brownhoist Corporation, Bay City, Mich.; WILLIAM H. STEWART, vice-president, Bethlehem Steel Export Corporation, New York, and LAWRENCE H. WETHERELL, Cambridge, Mass., metallurgist, Wetherell Brothers Co., are on the voting list of the autumn meeting, Sept. 10, for election to membership in the (British) Iron & Steel Institute.

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WILLIAM GUMMERE, open-hearth superintendent, John A. Roebling's Sons Co., Trenton, N. J., has been appointed general manager in charge of operation at Trenton and is succeeded in the open-hearth department by R. MERCUR, JR.

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STANTON L. DREIFUS, who has been connected with the scrap iron and steel industry for 25 years, has joined the organization of the Schiavone-Bonomo Corporation, scrap dealer, 11 West Forty-second Street, New York.

Extensive Safety Program at Chicago Meeting

Many sections of the National Safety Council have individual programs in the eighteenth annual Safety Congress to be held in the Stevens and Congress Hotels, Chicago, Sept. 30 to Oct. 4. Among the items are the following:

Paper, "Industrial Relations in Accident Control," by C. W. Bergquist, Western Electric Co., Chicago.

"Talk for Junior Safety Men," by Earl F. Blank, Jones & Laughlin Steel Corporation, Pittsburgh.

"Safety Committee in Action," a playlet directed by J. W. Benner, Homestead Works, Carnegie Steel Co., Munhall, Pa.

"Report on Annealing of Chains," by R. F. Thalner, safety director, Buick Motor Co., Flint, Mich.

"Structural and Sheet Metal Fabrication," by Daniel L. Royer.

"Noise and Its Relation to Accidents," by Dr. H. Clyde Snook.

"Hazards of Inter-department Trucking," by R. F. Thalner.

"Mechanical Safeguards on Construction Equipment," by E. H. Lichtenberg, chief engineer, Koehring Co., Milwaukee.

"Training Workers for Safety in Industry," by J. C. Wright, director, Federal Board of Vocational Education, Washington.

"Symposium on Physical Examinations in Industry," by Dr. C. H. Watson, medical director, American Telephone & Telegraph Co., New York; F. B. Thatcher, assistant general manager, By-Products Coke Corporation, Chicago; A. T. Lancaster, general foreman, Hawthorne Works, Western Electric Co., Chicago, and Dr. Guy L. Kiefer, commissioner of health, State of Michigan, Lansing.

"Report of Foundry Research Committee," by F. G. Bennett, Buckeye Steel Castings Co., Columbus, Ohio.

"What Is Safety First?" by P. J. Stremmel, general superintendent, Granite City Steel Co., Granite City, Ill.

"Report of Safe Practices Committee," by J. M. Woltz, Youngstown Sheet & Tube Co., Youngstown, Ohio.

"Progress in Gas Welding Safety," by H. S. Smith, consulting engineer, Union Carbide Co., New York.

"Safety Kinks in the Metal Industry," a film-strip, by John A. Oartel, Carnegie Steel Co., Pittsburgh, followed by general roundtable discussion.

Addresses before the Metals Section, by Dr. Harry Myers, Fricidaire Corporation, Dayton, Ohio; George Seyler, works manager, Lunkenheimer Co., Cincinnati; and J. E. Culliney, Bethlehem Steel Corporation, Bethlehem, Pa.

"Method of Promoting Accident Prevention," by F. C. Miller, Colorado Fuel & Iron Co., Trinidad, Colo.

"Safe and Unsafe Practices in Mining," a film-strip, by H. G. Hensel, Youngstown Sheet & Tube Co., Chicago.

"Power Press Accidents and Their Causes," by J. E. Walters, General Electric Co., Lynn, Mass.

"Drop Forge Manufacturing and Safety," by S. M. Hagens, Wyman-Gordon Co., Harvey, Ill.

"Safe Dies a Necessity," by R. A. Shaw, tool and die stamping division, Murray Corporation of America, Detroit.

"Safety Devices for Modern Machine Tools," by Luther D. Burlingame, Brown & Sharpe Mfg. Co., Providence.

Roundtable discussion on power press problems, led by C. B. Bartlett, Geuder, Paeschke & Frey Co., Milwaukee.

Crucible Steel Co. of America and the Halcomb Steel Co. have acquired a site, 156 x 180 ft., on East Fifty-fifth Street, Cleveland, on which they will build a two-story warehouse and office building with 30,000 sq. ft of floor space.

Fabricated Structural Steel

New Work, Amounting to 58,000 Tons, Is Largest Since Middle of July

MORE than one-half of the structural steel lettings the past week, totaling 22,000 tons, were for industrial projects. New work, amounting to 58,000 tons, was the largest since the middle of July. Twenty-seven thousand tons will go into the construction of bridges. Highway bridges at Cleveland and Portland, Ore., will require 15,000 tons and 8000 tons, respectively. Awards follow:

BOSTON, 1000 tons, South Station canopies, to New England Structural Co.

WALTHAM, MASS., 300 tons, hospital, to Barker Steel Co.

STATE OF NEW YORK, 175 tons, highway bridge, to American Bridge Co.

NEW YORK, 1500 tons, House of Detention on Tenth Street, to McClintic-Marshall Co.

STATE OF NEW JERSEY, 225 tons, highway bridge in Bergen County, to McClintic-Marshall Co.

STATE OF NEW JERSEY, 400 tons, highway bridge in Atlantic County, to Bethlehem Steel Co.

STATE OF NEW JERSEY, 1700 tons, highway bridge on route 75, sections 18 and 19, to Bethlehem Steel Co.

SAYREVILLE, N. J., 1000 tons, power house for Raritan River Power Co., to American Bridge Co.

PHILADELPHIA, 1000 tons, Dorset Boulevard, to Bethlehem Steel Co.

STATE OF PENNSYLVANIA, 100 tons, bridge over Cheat River, to Jones & Laughlin Steel Corporation.

STATE OF PENNSYLVANIA, 600 tons, highway bridge in Northumberland County, to McClintic-Marshall Co.

MONROE, LA., 2000 tons, Brown Paper Mill Co., to Virginia Bridge & Iron Co.

TONAWANDA, N. Y., 3000 tons, power house for General Electric Co., to McClintic-Marshall Co.

AUBURN, N. Y., 200 tons, cell building at Auburn prison, to Kellogg Structural Steel Co.

PITTSBURGH & WEST VIRGINIA RAILROAD, 2100 tons, viaducts on Connellsville extension, to American Bridge Co.

CLEVELAND, 900 tons, building for Bourne-Fuller Co., to Massillon Bridge & Structural Co.

DETROIT, 1100 tons, Wayne County airport hangar, to R. C. Mahon Co.

CHICAGO, 260 tons, plant addition, Taylor Forge & Pipe Works, to A. Bolter's Sons.

HAMMOND, IND., 800 tons, Lever Brothers soap plant, to Duffin Iron Works.

MILWAUKEE, 1250 tons, office building for the Milwaukee Electric Railway & Light Co., to Wisconsin Bridge & Iron Co.

MENASHA, WIS., 500 tons, factory addition for Marathon Paper Co., to Worden-Allen Co.

MILWAUKEE, WIS., 250 tons, emergency hospital of city of Milwaukee, to Wisconsin Bridge & Iron Co.

DALLAS, TEX., 1200 tons, Bell Telephone Co. Building, to McClintic-Marshall Co.

SAN FRANCISCO, 140 tons, apartment building, Pacific near Webster Street, to McClintic-Marshall Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

FALL RIVER, MASS., 100 tons, State bridge.

LITTLE FALLS, N. Y., 400 tons, high school.

SCARSDALE, N. Y., 300 tons, New York Telephone Co. building.

NEW YORK, 600 tons, apartment house at 1050 Fifth Avenue.

NEW YORK CENTRAL RAILROAD, 3000 tons, commissary building on 161st Street, New York.

PENNSYLVANIA RAILROAD, 2000 tons, warehouse in Jersey City.

STATE OF NEW JERSEY, 1000 tons, six highway bridges.

EDGEWATER, N. J., 6000 tons, assembly plant for Ford Motor Co.

CAMDEN, N. J., 800 tons, Camden Athletic Club building.

PENNSYLVANIA RAILROAD, 2400 tons, miscellaneous transmission line equipment.

PHILADELPHIA, 1600 tons, Henry Avenue bridge; F. A. Canuso & Son, low bidder on general contract.

BUFFALO, 600 tons, school No. 67.

BUFFALO, 300 tons, New York Central viaduct, Harlem Avenue.

CLEVELAND, 15,000 to 18,000 tons, Lorain-Central bridge.

CHICAGO, 3700 tons, Wendell Phillips Senior High School; Vierling Steel Works, low bidder.

PORTLAND, ORE., 8000 tons, St. John's bridge.

PHOENIX, ARIZ., 550 tons, generating plant for Central Arizona Light & Power Co.; bids being taken.

SACRAMENTO, CAL., 738 tons, bridge.

OAKLAND CAL., 1000 tons, hotel at Fourteenth and Jackson Streets.

SAN FRANCISCO, 150 tons, addition to apartment building at Sacramento and Mason Streets.

Railroad Equipment

Delaware, Lackawanna & Western Orders 1393 Cars

ORDERS were placed the past week for slightly less than 1800 cars. Of that number, 1393 are for the Delaware, Lackawanna & Western. Fresh inquiries are light. Details of the week's business follow:

Brooklyn & Queens Transit Corporation has ordered 50 single and center exit surface car bodies from J. G. Brill Co. and 50 from Osgood Bradley Co. The former also will supply 100 sets of trucks.

Delaware, Lackawanna & Western has ordered 141 steel suburban motor cars, equipped with roller bearings, from Pullman Car & Mfg. Corporation, 700 box cars, 250 hopper cars and two baggage and mail cars from American Car & Foundry Co. and 300 box cars from Magor Car Corporation. This carrier has placed an order with American Car & Foundry Co. for conversion of 141 suburban passenger cars into multiple-unit trailer cars.

South Buffalo Railway is inquiring for three eight-wheel switching locomotives.

Nashville, Chattanooga & St. Louis is in the market for five mountain-type locomotives.

Southern Pacific, Texas Lines, is inquiring for replacement parts to rebuild 400 box cars.

Columbia & Greenville has bought 300 box cars from American Car & Foundry Co.

Canadian National has contracted for one gasoline combination passenger and baggage rail motor car with the J. G. Brill Co.

Natchez, Columbia & Mobile is in the market for one or two 2-8-2 type locomotives.

Condon, Kinzua & Southern is expected to buy one 2-10-2 type locomotive.

Reinforcing Steel

Awards Total 5200 Tons and Inquiries 5500 Tons

AWARDS in the past week totaled 5200 tons, the largest having been 1200 tons for a Philadelphia hosiery plant. New projects will take about 5500 tons. A wharf at Oakland, Cal., will require 2300 tons. Awards follow:

RENSSELAER, N. Y., 450 tons, factory, to Kalman Steel Co.

PHILADELPHIA, 1200 tons, hosiery plant, to Taylor-Davis Co.

BARRINGTON, ILL., 1000 tons, warehouse for Jewel Tea Co., to Kalman Steel Co.

CHICAGO, 100 tons, plant for Ajax Quilting & Mfg. Co., to Inland Steel Co.

CHICAGO, 100 tons, factory, Diversey Boulevard and Tripp Avenue, to Concrete Engineering Co.

CHICAGO, 400 tons, film exchange building for Warner Brothers, to Concrete Engineering Co. (previously credited to unstated distributer).

KOHLER, WIS., 700 tons, Kohler Co. plant addition, to American System of Reinforcing.

SEATTLE, WASH., 1150 tons, West Garfield Street bridge, to Northwest Rolling Mills.

PASADENA, CAL., 100 tons, Atheneum building of California Institute of Technology, to Soule Steel Co.

Reinforcing Bars Pending

PENNSYLVANIA RAILROAD, 1500 tons, warehouse at Jersey City.

HARRISBURG, PA., 800 tons, farm show building.

PHILADELPHIA, 280 tons, laboratory for Gulf Refining Co. at Girard's Point.

PHILADELPHIA, 300 tons, Henry Avenue bridge.

BUFFALO, 150 tons, school No. 67.

BUFFALO, 200 tons, New York Central viaduct, Harlem Avenue.

FINDLAY, OHIO, 125 tons, building for Ohio Oil Co.

CHICAGO, 200 tons, apartment building at 6230 Kenmore Avenue; H. Janisch & Co., general contractor.

SUPERIOR, WIS., 500 tons, elevator; general contract awarded to Fegles Construction Co., St. Paul, Minn.

OAKLAND, CAL., 2300 tons, wharf foot of Ninth Street.

OAKLAND, CAL., 210 tons, wharf foot of Fourteenth Street.

SACRAMENTO, CAL., 285 tons, paving in Marin County.

Large Steel Exports Continue

Seven-Month Total Largest Since 1921—Gain Over 1928 in Rolled and Finished Was 19 Per Cent—Imports Heavier, Too

WASHINGTON, Aug. 29.—Aggregating 270,532 gross tons, exports of iron and steel products from the United States in July of the present year exceeded those of June, amounting to 247,811 tons, by 22,721 tons and were the largest since April, when they totaled 287,297 tons. For the seven months ended with July exports were 1,862,371 tons, or 251,604 tons greater than last year, with a total of 1,610,371 tons. Exports in July of last year amounted to 253,405 tons. The daily average for July, 1929, was 8727 tons, compared with 8260 tons in June.

Imports in July also showed an increase, rising to 71,378 tons from 63,635 tons in June, a gain of 7743 tons. For the first seven months they were 429,223 tons, a decrease of 18,432 tons under the imports of 447,655 during the corresponding period of last year. Imports in July of last year were 53,567 tons. The daily average in July was 2302 tons, against 2121 tons in June.

Of the 37 classes listed in THE IRON AGE export table, gains were made in outgoing shipments in 20, with losses in the remaining 17, when compared with exports in June. Pig iron exports increased to 7777 tons from 3101 tons and reflected an unusual situation in that outgoing shipments exceeded imports, the latter amounting to only 6743 tons. Exports of scrap in July were 47,018 tons, against 42,816 tons.

In the finished lines, galvanized sheets exported in July increased to 14,154 tons from 12,604 tons and exports of black steel sheets increased to 18,259 tons from 15,718 tons while exports of plates rose to 19,675 tons from 17,640 tons. Among the products showing declines were plain structural shapes which dropped to 29,946 tons from 31,268 tons and tin plate, which fell to 16,875 tons from 18,041 tons.

Pig iron was exported in July chiefly to Japan, 5702 tons, and to Canada, 1724 tons. Scrap exports were widely distributed, Canada taking 11,281 tons; Italy, 9609 tons; Japan, 8861 tons; Poland, 6633 tons; Germany, 4900 tons; Spain 2347 tons and Mexico, 2007 tons.

Of the 6447 tons of casing and oil line pipe exported, 2112 tons went to Venezuela and 1370 tons to Canada. Canada took 4050 tons and the United

Exports of Iron and Steel from the United States

(In Gross Tons)

	July		Seven Months Ended July	
	1929	1928	1929	1928
Pig iron	7,777	8,598	38,567	33,927
Ferromanganese	40	1,137	1,053	5,998
Scrap	47,018	43,932	296,738	295,063
Pig iron, ferroalloys and scrap	*54,835*	*53,667*	*336,358*	*334,988*
Ingots, blooms, billets, sheet bar	1,236	941	26,287	11,240
Skelp	13,976	15,079	67,771	61,636
Wire rods	5,822	3,638	28,882	22,167
Semi-finished steel	*21,034*	*19,658*	*122,940*	*95,043*
Steel bars	17,183	13,795	129,803	84,563
Alloy steel bars	547	1,102	11,947	8,594
Iron bars	167	471	2,921	2,314
Plates, iron and steel	19,675	14,648	126,971	86,374
Sheets, galvanized	14,154	15,341	100,574	90,466
Sheets, black steel	18,259	19,100	111,022	109,411
Sheets, black iron	1,428	1,355	9,073	8,843
Hoops, bands, strip steel	4,734	4,987	47,592	32,684
Tin plate; terne plate	16,875	21,528	152,996	146,627
Structural shapes, plain material	29,946	14,533	175,812	104,406
Structural material, fabricated	10,392	14,191	65,063	54,417
Steel rails	9,999	11,079	95,565	120,203
Rail fastenings, switches, frogs, etc.	3,102	2,504	20,149	30,078
Boiler tubes	1,746	1,573	11,306	9,931
Casing and oil-line pipe	6,447	10,189	79,421	64,632
Black and galvanized welded pipe	14,880	11,436	83,664	65,337
Malleable iron screwed pipe fittings	1,070	1,115	7,361	5,526
Plain wire	3,591	3,264	29,728	26,936
Barbed wire and woven wire fencing	5,695	5,537	41,383	43,963
Wire cloth and screening	125	216	1,037	1,065
Wire rope	736	386	4,658	2,964
Wire nails	1,352	1,425	9,210	10,032
Other nails and tacks	1,033	837	6,382	6,095
Horseshoes	37	64	220	269
Bolts, nuts, rivets and washers, except track	1,232	1,262	9,359	7,762
Rolled and finished steel	*184,405*	*171,939*	*1,333,217*	*1,123,492*
Cast iron pipe and fittings	3,849	2,490	20,944	19,850
Car wheels and axles	1,645	928	14,112	8,552
Iron castings	901	776	7,980	7,713
Steel castings	966	1,097	7,265	6,337
Forgings	1,039	1,168	8,252	6,140
Castings and forgings	*8,400*	*6,459*	*58,553*	*48,592*
All other	1,858	1,683	11,303	8,652
Total	270,532	253,405	1,862,371	1,610,767

Imports of Iron and Steel into the United States

(In Gross Tons)

	July		Seven Months Ended July	
	1929	1928	1929	1928
Pig iron	6,743	6,055	80,204	81,350
Ferromanganese*	5,213	2,891	37,797	27,296
Ferrosilicon‡	1,079	332	5,216	2,043
Ferrochrome†	142	58	382	396
Scrap	9,101	3,688	52,374	26,532
Pig iron, ferroalloys and scrap	*22,278*	*13,024*	*175,973*	*137,617*
Steel ingots, blooms, billets and slabs	3,519	1,218	15,902	13,088
Wire rods	1,242	595	9,838	10,012
Semi-finished steel	*4,761*	*1,813*	*25,740*	*23,100*
Rails and splice bars	1,067	1,534	4,127	11,180
Structural shapes	18,247	11,192	87,354	100,034
Boiler and other plates	34	198	2,456	3,355
Sheets and saw plates	2,818	1,160	13,248	15,999
Steel bars	3,209	4,992	21,481	55,338
Bar iron	127	35	2,110	1,386
Hoops, bands and cotton ties	6,770	6,630	21,448	21,495
Tubular products (wrot.)	3,192	2,918	25,248	23,973
Nails, tacks, staples	800	1,020	5,340	4,863
Tin plate	31	159	173	751
Bolts, nuts, rivets and washers	29	11	165	154
Round iron and steel wire	490	408	3,756	2,440
Barbed wire	577	226	3,542	1,975
Flat wire; strip steel	137	132	1,240	1,339
Steel telegraph and telephone wire	.....	10	.....	153
Wire rope and strand	247	168	1,511	971
Other wire	17	42	366	320
Rolled and finished steel	*37,792*	*30,835*	*193,565*	*245,726*
Cast iron pipe	6,383	7,731	32,657	39,248
Castings and forgings	164	164	1,288	1,964
Total	71,378	53,567	429,223	447,655
Manganese ore*	48,406	21,447	214,008	105,364
Iron ore	301,418	183,256	1,769,154	1,415,669
Magnesite (dead burned)	.....	3,912	12,111	31,386

*Manganese content only.
‡Silicon content only.
†Chromium content only.

Kingdom 1024 tons of the 10,773 tons of black welded pipe exported. Of the 17,183 tons of steel bars exported, 8433 tons went to Canada, 2688 tons to the United Kingdom and 2265 tons to Japan. Canada took 26,601 tons of the plain structural shapes and 4334 tons of the tin plate shipments, while China took 2737 tons of tin plate and Japan 1994 tons. The great bulk of steel plates, 16,931 tons, went to Canada.

Philippine Islands was the largest buyer of galvanized sheets, taking 3302 tons, Canada taking 2546 tons. Exports of black steel sheets to Canada were 7559 tons, while Japan took 3624 tons. The exports of black steel sheets to Canada were 7559 tons, while Japan took 3624 tons. The exports of steel rails, amounting to 9999 tons, were distributed rather evenly, Argentina taking 1857 tons; Chile, 1609 tons; Mexico, 1413 tons and Canada, 1128 tons. Japan took only 175 tons.

Total exports to Canada in July were 118,069 tons. For the seven months ended with July, shipments to Canada amounted to 792,942 tons, compared with 633,877 tons for the corresponding period of last year. This gain was almost two-thirds of the total gain to all countries. Exports to Japan in July totaled 31,330 tons; for the first seven months they were 218,072 tons, compared with 214,541 tons during the like period of last year.

While there were gains made in imports in only 10 of the 26 classes as against 15 losses, with no incoming shipments in either month of telegraph and telephone wire, the increased movement in July as compared with June was due to the sharp rise in receipts of structural shapes, amounting to 18,247 tons as against 12,274 tons. Pig iron imports dropped from 11,396 tons in June.

Of the incoming shipments of structural shapes, Belgium provided 9322 tons; Germany, 4434 tons and France, 4233 tons. France supplied 6213 tons of the 6383 tons of cast iron pipe imported. Of the 3209 tons of steel bars imported, 1550 tons came from Sweden, 682 tons from Belgium, 407 tons from France and 359 tons from Germany.

Canada was the source of 2799 tons of the 5213 tons of ferromanganese imported; Norway, 1212 tons and the United Kingdom, 1077 tons. Soviet Russia provided 41,355 tons of the 48,406 tons of manganese concentrates imported; Brazil, 4077 tons and India, 2844 tons. The principal countries from which products were imported in July were Belgium, 15,497 tons; France, 13,556 tons; Canada, 13,305 tons and Germany, 13,163 tons. In June no country furnished as much as 13,000 tons.

UNITED STATES IMPORTS OF IRON AND STEEL PRODUCTS
(In Gross Tons)

	July	June
Austria	50	34
Belgium	15,497	9,888
Bulgaria	170	....
Czechoslovakia	....	660
France	13,556	9,965
Germany	13,163	12,580
Italy	217	387
Netherlands	837	....
Norway	1,668	3,677
Poland	....	1,629
Sweden	3,491	3,835
Switzerland	40	3
United Kingdom	4,034	5,790
Europe	*52,723*	*48,448*
Canada	13,305	10,042
Mexico	33	39
Cuba	195	1,200
British India	5,120	3,903
Japan	2	3
Total	71,378	63,635

Increased Orders for Steel Castings

WASHINGTON, Aug. 27.—Making a gain of 8451 tons, orders for commercial steel castings in July totaled 103,447 tons, or 71 per cent of capacity, compared with 94,996 tons, or 65 per cent of capacity, in June, according to reports received by the Department of Commerce from 127 producers with a present capacity of 145,700 tons, which represents more than 80 per cent of the total capacity of the country. Production in July was 119,474 tons, or 82 per cent of capacity, against 116,009 tons, or 80 per cent of capacity, in June.

Orders for railroad specialties in July were 37,383 tons, or 55 per cent of that class of capacity, against 34,947 tons, or 52 per cent of capacity, in June. Orders for miscellaneous castings were 66,064 tons, or 85 per cent of such capacity, compared with 60,049 tons, or 77 per cent of capacity.

Total orders for the first seven months were 827,176 tons, against 576,260 tons for the corresponding period of last year. Production was 790,757 tons in seven months, compared with 605,913 tons.

New Fractional Motor Plant

The Domestic Electric Co., Cleveland, according to Carl A. Duffner, president, has purchased a group of buildings and a tract of land at Kent, Ohio, to be devoted to the manufacture of fractional horsepower motors of the universal type. The new plant will more than double the capacity of the present plant in Cleveland. All buildings are reinforced concrete with automatic sprinkler systems, three stories in height.

The motors are designed for nationally advertised electric household appliances, electric-driven tools and commercial electric appliances. The Domestic company is a division of Black & Decker, Towson, Md. Other companies in this group are the Van Dorn Electric Tool Co., Cleveland; Black & Decker Mfg. Co., Ltd., Canada; Black & Decker, Ltd., England; and Marschke Mfg. Co., Indianapolis.

Destination of Iron and Steel Exports from the United States
(In Gross Tons)

Country of Destination	July, 1929	June, 1929	July, 1928	January Through July 1929	January Through July 1928
North and Central America and West Indies	*143,303*	*139,449*	*124,440*	*958,054*	*772,689*
Canada and Newfoundland	118,163	117,056	100,358	793,777	636,192
Cuba	5,847	4,624	6,289	42,199	37,535
Guatemala	949	335	264	4,776	6,099
Honduras	495	736	508	7,222	4,459
Mexico	11,906	10,876	6,999	57,991	46,796
Panama	780	1,040	1,248	11,001	9,756
Salvador	462	234	307	4,675	2,218
British West Indies	697	1,662	514	13,082	4,881
Other West Indies	3,006	2,127	4,348	17,390	19,383
Other Central America	998	759	575	5,941	5,370
South America	*28,701*	*27,026*	*38,366*	*244,022*	*255,716*
Argentina	6,421	8,420	6,544	60,208	57,746
Brazil	6,739	4,681	9,527	40,255	50,835
Chile	5,074	2,879	4,157	36,915	40,282
Colombia	2,725	2,723	7,391	27,455	42,597
Peru	3,056	2,365	900	20,748	14,290
Uruguay	381	374	354	5,822	5,438
Venezuela	4,024	5,189	9,239	49,337	41,139
Other South America	261	395	254	3,282	3,389
Europe	*36,905*	*31,599*	*32,300*	*229,557*	*181,973*
Belgium	149	165	1,690	1,949	8,987
France	3,636	1,564	440	13,490	2,939
Germany	5,017	766	192	17,741	20,607
Italy	10,333	10,495	8,274	74,765	52,375
Netherlands	226	168	99	1,740	1,432
Poland and Danzig	6,634	7,406	13,765	54,396	45,805
Rumania	479	182	537	2,284	2,933
Soviet Russia	131	159	407	2,243	1,976
United Kingdom	6,005	5,455	5,010	37,316	31,464
Other Europe	4,295	5,239	1,886	23,633	13,455
Far East	*59,888*	*46,982*	*66,189*	*416,906*	*391,346*
British Malaya	382	85	442	4,790	3,856
China	4,740	4,587	6,723	46,091	64,258
Netherlands East Indies	7,452	3,269	3,690	44,273	17,741
India and Ceylon	382	1,440	761	11,628	14,326
Japan	31,330	27,558	32,969	218,072	214,541
Kwangtung	617	609	1,498	8,488	4,479
Philippine Islands	11,302	5,078	11,093	58,353	55,226
Australia	2,116	2,593	1,610	13,563	9,195
New Zealand	142	226	164	2,937	1,211
Other Asia and Far East	925	1,537	1,236	8,711	6,513
Africa	*2,235*	*2,755*	*1,140*	*13,832*	*9,043*
Union of South Africa	1,168	1,029	333	5,361	3,813
Egypt	585	1,100	323	5,780	3,411
Mozambique	528	288	311	1,432	790
Other Africa	154	338	173	1,259	1,029
Total	270,532	247,811	253,495	1,862,371	1,610,767

Second Highest Machinery Exports

Total for Seven Months Greatest Ever Made—Imports Far Above Last Year—Agricultural Implements Large in Both Lists

WASHINGTON, Aug. 24.—Continuing their rising tendency, exports of machinery of all kinds in July were valued at $56,973,585, as compared with $49,732,282 in June, an increase of $7,241,303. The total was the second highest ever recorded, having been exceeded only by the $59,507,795 of last March. For July of last year they were valued at $47,830,687.

For the first seven months machinery exports were valued at $362,757,783, a gain of $74,177,580 (or 26 per cent) over exports for the corresponding period of 1928 with a value of $287,580,203. The total this year makes a new high record for that period.

Exports of machinery and vehicles in July were valued at $107,697,415, against $104,994,973 in the preceding month and $95,663,337 in July of last year. For the first seven months they were valued at $779,356,344, against $603,803,130 for the corresponding period of last year, an increase of $175,553,214, or 29 per cent.

Exports of industrial machinery in July, as classified by the Division of Statistics, Department of Commerce, were valued at $25,322,120, against $22,392,023 in June and $20,902,855 in July of last year. For the first seven months of 1929 they were valued at $163,872,038, compared with $129,259,555 for the corresponding period of 1928.

Exports of power-driven metal-working machinery, as listed in THE IRON AGE table, totaled 1180 units, valued at $1,480,982 as compared with 886, valued at $1,537,399 in June. Exports of agricultural machinery and implements in July were valued at $14,722,000, against $12,041,000 in June and $13,996,000 in July of last year. They aggregated $86,791,000 for the first seven months of the present year, against $68,007,000 for the same period of 1928.

Imports of machinery and vehicles in July were valued at $4,036,771, compared with $3,714,910 in June and $2,306,665 in July of last year. For the first seven months they were valued at $25,896,311, compared with $16,238,818 for the like period of last year.

Imports of industrial, office and printing machinery in July, 1929, were valued at $2,288,438, against $2,111,168 in June and $1,516,328 in July of last year. They rose to $14,775,972 during the first seven months of the current year, against $9,947,108 for the corresponding period of last year.

Imports of machinery as listed in THE IRON AGE table were valued at $2,855,506 in July, against $2,609,261 in June and $1,613,165 in July of last year. For the first seven months they were valued at $19,630,421, against $12,119,581 for the similar period of 1928.

Machinery Exports from the United States

(By Value, in Thousands of Dollars)

	July		Seven Months Ended July	
	1929	1928	1929	1928
Locomotives	$814	$625	$1,748	$1,650
Other steam engines	17	90	289	640
Boilers	109	114	1,145	695
Accessories and parts	57	27	560	363
Automobile engines	549	1,354	8,297	9,347
Other internal combustion engines	816	876	5,950	4,989
Accessories and parts	428	303	2,790	2,253
Electric locomotives	121	36	563	1,069
Other electric machinery and apparatus	1,197	805	7,877	4,608
Excavating machinery	918	470	5,060	4,480
Concrete mixers	167	104	877	614
Road-making machinery	313	252	2,144	1,755
Elevators and elevator machinery	452	477	3,033	2,624
Mining and quarrying machinery	1,688	1,120	10,050	8,133
Oil-well machinery	2,346	1,587	15,229	8,406
Pumps	1,018	754	7,264	4,628
Bending and power presses	386	208	2,224	1,124
Forging machines	141	57	914	464
Machine tools*	2,913	2,562	20,041	14,706
Other metal-working machinery and parts	633	565	4,537	3,536
Textile machinery	1,192	1,094	8,180	7,924
Sewing machines	994	726	6,180	5,198
Shoe machinery	124	106	1,184	1,053
Flour-mill and gristmill machinery	40	46	343	277
Sugar-mill machinery	197	340	1,639	2,500
Paper and pulp-mill machinery	293	227	1,901	1,931
Sawmill machinery	65	92	533	550
Other woodworking mach'ry	254	128	1,413	1,044
Refrigerating and ice-making machinery	1,442	1,088	9,157	5,315
Air compressors	733	660	4,573	4,135
Typewriters	2,396	1,507	14,605	13,189
Power laundry machinery	256	93	1,248	679
Typesetting machines	485	435	3,569	2,704
Printing presses	536	464	4,402	3,515
Agricultural machinery and implements	14,722	13,996	86,791	68,007
All other machinery and parts	18,162	14,443	116,448	93,475
Total	$56,974	$47,831	$362,758	$287,580

*Principal details in another table.

Exports of Power-Driven Metal-Working Machinery

	July, 1929		June, 1929	
	No.	Value	No.	Value
Engine lathes	72	$155,015	65	$182,174
Turret lathes	43	104,389	34	112,281
Other lathes	65	119,984	82	155,430
Vertical boring mills and chucking machines	20	62,880	7	25,035
Thread-cutting and automatic screw machines	114	176,920	82	139,858
Knee and column type milling machines	24	48,860	32	79,526
Other milling machines	44	99,031	76	148,434
Gear-cutting machines	55	191,494	41	117,640
Vertical drilling machines	40	25,520	36	51,231
Radial drilling machines	10	31,830	9	25,024
Other drilling machines	451	97,408	81	78,314
Planers and shapers	41	77,610	79	100,262
External cylindrical grinding machines	76	166,979	44	134,868
Internal grinding machines	29	68,774	41	121,314
Metal-working tool-sharpening machines	96	54,288	177	66,008
Total	1,180	$1,480,982	886	$1,537,399

Imports of Machinery Into the United States

(By Value)

	July		Seven Months Ended July	
	1929	1928	1929	1928
Metal-working machine tools	$136,582	$56,209	$756,542	$367,147
Agricultural machinery and implements	851,341	315,010	6,294,201	3,228,226
Electrical machinery and apparatus	380,468	161,535	1,669,777	1,322,076
Other power-generating mach'ry	101,969	38,480	755,301	123,303
Other industrial machinery	868,622	734,139	6,999,812	5,337,416
Vehicles except agricultural	516,524	313,792	3,154,788	1,741,408
Total	$2,855,506	$1,613,165	$19,630,421	$12,119,581

July Automobile Output Lowest Since February

WASHINGTON, Aug. 23.—Motor vehicles to the number of 500,331 were produced in the United States in July, passenger units totaling 426,159; trucks, 73,118; and taxicabs, 1054, according to the Department of Commerce. Production in June totaled 545,375 vehicles, of which 452,624 were passenger cars, 91,373 were trucks and 1378 were taxicabs. Canadian production in July was 17,461 units, of which 13,600 were passenger cars and 3861 were trucks, comparing with 21,492 in June, of which 16,511 were passenger cars and 4981 were trucks.

For the first seven months of the current year 3,723,723 motor vehicles were produced in the United States, 3,198,497 being passenger cars, 513,539 trucks and 11,687 taxicabs. Motor vehicle production for the corresponding period of last year totaled 2,593,607 units, of which 2,301,199 were passenger cars, 288,835 trucks and 3573 taxicabs. The increase in passenger cars was 39 per cent; in trucks, 78 per cent; in taxicabs, 227 per cent.

Truck and taxicab production in seven months was greater than the entire year's production for any year previous to 1928, when 537,623 were made. Passenger car output in seven months was greater than for the 12 months of 1927. Total production in July, while larger than for any month of any preceding year, was the lowest since February.

Canadian output for the first seven months of 1929 was 205,822, of which 165,213 were passenger cars and 40,609 were trucks. For the corresponding period of last year the total was 150,214 units, of which 127,991 were passenger cars and 22,223 were trucks.

Labor Maintains Efficiency

Although high wages have in the past been regarded as a signal for a falling off in labor efficiency, no such tendency seems apparent in the present era of prosperity, according to the Business Conditions Weekly of the Alexander Hamilton Institute. Since 1919 factory wages have increased 19 per cent. At the same time, factory output has increased 43 per cent and the cost of labor per unit has fallen about 22 per cent.

This extraordinary increase in factory labor efficiency, doubtless due partly to use of machinery, is accompanied by evidence of labor contentment. During the first five months of 1929 there has been a monthly average of only 72 strikes as compared with a monthly average of 303 for 1919.

Malleable Castings Orders, Output, Shipments Fall

WASHINGTON, Aug. 24.—Orders for malleable castings in July totaled 61,988 net tons, compared with 65,377 tons in June, according to reports received by the Department of Commerce from 123 firms operating 137 plants. A year ago the orders were 60,964 tons in July. Output was 70,132 tons, or 73.2 per cent of capacity in July, against 72,512 tons, or 75.2 per cent of capacity, in June and 60,290 tons, or 63.1 per cent, a year ago. Shipments were 69,940 tons in July, 72,608 tons in June and 60,084 tons in July, 1928.

For the first seven months, orders aggregated 526,867 tons this year, against 444,973 tons last year. Production was 538,718 tons, or 80.4 per cent of capacity, compared with 455,164 tons, or 67.4 per cent of capacity.

Orders, shipments and production in July made the lowest totals for any month so far in 1929. Production, however, was higher in July than for any month of 1928, and shipments were above any 1928 month except March.

Factory Earnings Remain High

Average weekly earnings in representative factories in New York State, including all employees in both office and shop, were $30.02 in June. There has been a gradual drop from the record of $30.35 in March to $30.07 in April and $30.03 in May. Otherwise, except for $30.12 last December, there has been no month in which the average has been above $30. It was $29.48 in June, 1928, registering a drop to $29.15 in July before the fall improvement began.

Employment and Payroll Totals in Identical Plants in June and May[a]

	Establishments	Number on Payroll		Weekly Payroll [b]	
		June	May	June	May
Iron and steel	206	286,815	286,103	$9,415	$9,590
Foundry and machine shop	1,057	291,801	290,977	9,109	9,265
Machine tools	145	39,929	39,329	1,321	1,312
Hardware makers	69	32,559	32,795	853	863
Steam and hot-water appliances	111	32,584	33,258	948	988
Stoves	113	20,136	20,291	566	579
Structural ironwork	165	28,536	27,994	863	853
Cast iron pipe	44	12,477	12,069	293	281

[a] United States Bureau of Labor Statistics.
[b] Thousands of dollars.

Fabricated Plate Orders Ahead of Last Year

WASHINGTON, Aug. 26.—Orders for fabricated steel plate in July totaled 46,686 tons, according to reports received by the Department of Commerce from 48 firms, and represented 61.7 per cent of capacity. This compares with 45,918 tons or 57.5 per cent of capacity in June, and with 35,959 tons and 46.8 per cent in July, 1928. Orders in July and June, respectively, were distributed as follows: Oil storage tanks, 14,963 tons and 6890 tons; refinery materials and equipment, 3180 tons and 4383 tons; tank cars, 1835 tons and 1998 tons; gas holders, 5352 tons and 5444 tons; blast furnaces, 2650 tons (the largest total in many months) and 1003 tons; stacks and miscellaneous, 18,706 tons and 26,200 tons.

For the first seven months orders have aggregated 330,300 tons, or 59.5 per cent of capacity, against 296,442 tons, or 53.3 per cent of capacity, for the corresponding period of last year.

Pittsburgh Water Shipments in July

The United States Engineer Office, Pittsburgh, reports a movement of 102,963 net tons of iron and steel products on the Ohio River in July, compared with 116,679 tons in June, and 90,145 tons in July, 1928. On the Monongahela River 109,051 net tons of these products were carried in July, against 116,157 tons the month before and 91,834 tons in July last year. Allegheny River commerce in iron and steel products amounted in July to only 25 tons; in June it was 722 tons, while it was nil in July last year.

Factory Building Cost Down

The cost of new factory construction is 10 per cent below the average for the last 10 years, according to a survey of building costs throughout the country just made by the Austin Co., engineer and builder, Cleveland. This company has found that the cost of industrial construction is now 40 per cent under the peak reached in 1920 and is at its lowest point since late in 1922. The computation is based on a standard building, 100 x 200 ft., and includes the cost of material and labor.

Trackwork Shipments Drop

Shipments of trackwork in July, as reported by the American Iron and Steel Institute, totaled 13,844 net tons, compared with 14,838 tons in June and 16,333 tons in May. Shipments in July, 1928, were 11,776 tons. The year to Aug. 1 shows shipments of 99,281 tons, against 88,905 tons for the corresponding seven months of 1928.

Machinery Markets and News of the Works

Tool Market Shows Vitality

New York District Bookings Unusually Good, But Business Elsewhere Has Tapered

ALTHOUGH August sales have not kept pace with those of July, largely on account of seasonal conditions, the machine tool business has shown remarkable midsummer vitality.

Bookings in the New York district have been especially good, and one important Eastern seller expects August to be the best month of the year. However, the volume of orders in other parts of the country has tapered somewhat and the actual placing of contracts has been delayed in many cases because of the absence of executives on vacations.

With few exceptions, sales have consisted of one or two machines each. The unfavorable delivery situation is proving a handicap to machine tool builders in closing inquiries. In fact, some buyers, notably the smaller ones, are withdrawing from the market rather than wait indefinitely for delivery of tools.

The General Electric Co. has made further purchases and has issued a fair-sized list, which includes equipment to be used in a department developing new apparatus for recording and reproducing talking motion pictures. The International Harvester Co. is reported to have bought most of its equipment for its tractor plant at Rock Island, Ill., and the Westinghouse Electric & Mfg. Co. has been ordering freely against its third quarter requirements.

The New York Central is inquiring for a number of tools for its Harmon, N. Y., shops, but otherwise prospective railroad business is negligible. A Connecticut manufacturer has contracted for 12 milling machines and another New England company has purchased $40,000 worth of tools.

New York

NEW YORK, Aug. 27.—Machine tool business in this district shows remarkable midsummer vitality. One of the important New York sellers expects that its August business will be the largest of any month this year. Others are also doing well, although some report slightly less volume than was booked in July. One of the large orders of the week came from a New England company and totaled more than $40,000. Pending inquiries from a New Jersey company total about $80,000. The General Electric Co. has bought a number of tools and has issued a fair-sized list, some of the new equipment to be used in the department which is developing a new apparatus for recording and reproducing talking moving pictures. The New York Central Railroad has issued a number of inquiries for tools for its new shop at Harmon, N. Y., and it is understood that a list of considerable size will be purchased. A Western aircraft company will locate in Elizabeth, N. J., and is expected to be a buyer of some shop equipment.

Contract has been let by American Can Co., 230 Park Avenue, New York, to United Engineering & Construction Co., Front Street, Elizabeth, N. J., for additions to plant at 330-32 Elizabeth Avenue, Newark, consisting of three one-story units 100 x 120 ft., 81 x 84 ft., and 60 x 81 ft., last noted with three-story extension, and one-story boiler plant, to be used for machine shop and other mechanical service, reported to cost about $140,000 with equipment. Company engineering department is in charge. Following recent purchase of plant of Canadian Canners, Ltd., Simcoe, Ont., for reported consideration of approximately $1,000,000, plans are reported under way for two and three-story plant, 100 x 150 ft., and 100 x 250 ft., at that place, to cost upward of $800,000 with equipment.

N. Liesenbein's Sons, Inc., 257 Hancock Street, Long Island City, manufacturer of furniture frames, etc., has purchased four-story factory, 80 x 100 ft., at Hinsdale Street and Atlantic Avenue, Brooklyn, and will occupy for new plant at early date.

F. L. Smith Machine Co., Inc., 633 West Forty-fourth Street, New York, has filed plans for extensions and improvements in five-story plant, reported to cost about $35,000. Russell G. Cory, 30 Church Street, is architect and engineer.

Aero Supply Co., College Point, L. I., manufacturer of aircraft hardware, etc., has work under way on new addition and will equip to provide about 25 per cent in present capacity, reported to cost more than $60,000. Company has recently acquired National Steel Products Co., Dayton, Ohio, manufacturer of steel specialties for aircraft; and Standard Automatic Products Corporation, Corry, Pa., manufacturer of turnbuckles, etc., for airplane service.

Cutler-Hammer Mfg. Co., 8 West Fortieth Street, New York, manufacturer of electrical control devices and equipment, with main plant at Milwaukee, is having plans drawn for a six-story addition, 90 x 150 ft., to New York works at Southern Boulevard and 144th Street, to cost more than $300,000 with equipment. Barney-Ahlers Construction Corporation, 110 West Fortieth Street, is architect and engineer.

Airport Lighting, Inc., 10 East Fortieth Street, New York, recently organized under Delaware laws with capital of 100,000 shares of stock, no par value, plans operation of plant for manufacture of automatic electric lighting equipment for night landing at airports. F. G. Ericson is president.

Brooklyn Edison Co., Pearl and Willoughby Streets, Brooklyn, operated by New York Edison Co., Irving Place and Fifteenth Street, New York, has authorized enlargement of steam-operated electric generating plant on Hudson Avenue, to increase capacity from 340,000 to 450,000 kw., estimated to cost $7,000,0000. Contract for prime movers has been let, and awards for auxiliary equipment will be made at early date. Expansion is scheduled for completion in about 12 months.

Alfred Hofmann, Inc., 635 Fifteenth Street, West New York, N. J., manufacturer of knitting machinery for hosiery mills, with assembling division for imported machines for like service, has plans for a two-story addition, 100 x 125 ft., including improvements in present plant, reported to cost more than $70,000 with equipment. Lockwood Greene Engineers, Inc., 1 Pershing Square, New York, is architect and engineer.

American Transformer Co., 178 Emmet Street, Newark, manufacturer of transformers for electric power and radio service, has awarded general contract to J. J. Thomas, 428 Peshine Avenue, for two-story addition to cost close to $40,000 with equipment.

Durant Motor Co., 250 West Fifty-seventh Street, New York, will discontinue operations at plant on Frelinghuysen Avenue, Newark, on Sept. 30, and works will be closed down permanently about middle of October. Equipment now in service for metal division, last remaining unit at plant, will be removed to plant of City Auto Stamping Co., Toledo, Ohio, which will furnish metal stampings in future for main plant of Durant company at Lansing, Mich. Negotiations are reported un-

der way by American Eagle Aircraft Corporation, Kansas City, Mo., for acquisition of Newark plant, for use as Eastern branch works.

Pennsylvania Dock & Warehouse Co., Jersey City, N. J., recently organized, will construct and operate eight-story cold storage warehouse and refrigerating plant, 230 x 900 ft., on local site, near Exchange Place, referred to in these columns last week as project of Pennsylvania Railroad Co., which will have financial interest in new company. Entire plant will cost close to $5,000,000 with machinery, instead of smaller amount previously noted. Company has arranged for bond issue of $5,750,000, to provide funds for project. George F. Bial, 147 Summit Avenue, Union City, N. J., is architect. W. J. MacMillan is president.

Charles Shilowitz, 26 Journal Square, Jersey City, N. J., architect, has plans for a four-story automobile service, repair and garage building at Sip and Summit Avenues, reported to cost over $100,000 with equipment.

Philadelphia

PHILADELPHIA, Aug. 27.—Delta File Works, Inc., 4837 James Street, Philadelphia, manufacturer of files, rasps, etc., has awarded general contract to William F. Lotz, Frankford Street and Oxford Avenue, for one-story addition, 40 x 75 ft., reported to cost about $25,000 with equipment.

I. Fischman & Sons, Inc., Tenth Street and Allegheny Avenue, Philadelphia, manufacturer of soda fountain equipment, is planning consolidation of three existing plants in new two- and three-story factory on Erie Avenue, from F to G Streets, including former plant of Stanley H. Knight Co., 216 West Superior Street, Chicago, lately acquired for consolidation with Fischman organization. New plant will provide about four times present floor space, and is estimated to cost $1,500,000 with machinery. Maurice Fischman is president.

Wilkening Mfg. Co., Fifteenth and Mount Vernon Streets, Philadelphia, manufacturer of piston rings, etc., is considering new two-story plant at Spring and Seventy-first Streets, reported to cost more than $45,000 with equipment. F. W. Wilkening is president.

City Council, Philadelphia, will take title early in September to Hog Island shipyard from the Government, totaling about 995 acres of land, as site for proposed municipal airport. Plans will be prepared for hangars, repair and reconditioning shops and other mechanical field units, as well as marine and rail facilities, entire project to cost $1,000,000, in which amount a bond issue is being arranged.

Hiergesell Brothers, 2011 Bellevue Avenue, Philadelphia, manufacturer of scientific instruments, thermometers, etc., has leased a floor in building at 2518 North Broad Street, and will occupy for increased manufacture.

Interests headed by Janney & Co., 1529 Walnut Street, Philadelphia, and Prince & Whitely, 25 Broad Street, New York, investment securities, have purchased control of Autocar Co., Ardmore, Pa., manufacturer of motor trucks. Company will be reorganized and general expansion program carried out for increased production. Robert P. Page, Jr., will continue as president; J. C. Taney, heretofore treasurer, has been elected senior vice-president.

City Council, Haddonfield, N. J., is reported considering construction of municipal electric light and power plant, and artificial gas plant, and will have estimates of cost made in near future. Frederick T. Holloway is commissioner of public works.

Board of Education, Mechanicsburg, Pa., is said to be planning installation of manual training equipment in new addition to high school at High and Simpson Streets, to cost $180,000, for which bids have been asked on general contract. C. J. Lappley, Front and Harris Streets, Harrisburg, Pa., is architect.

Glen Alden Coal Co., Scranton, Pa., will carry out an expansion and improvement program at its Diamond colliery near Hazleton, Pa., to include the electrification of the properties, with installation of electric hoists, pumping apparatus, etc. Colliery will be closed for six weeks to carry out work.

Plans have been arranged for merger of Wilburham-Greene Blower Co., Pottstown, Pa.; Cartersville Blower Co., Cartersville, Pa.; and Stacey Brothers Gas Construction Co., Carthage Pike, Cincinnati, manufacturers of gas works machinery, mechanical blowers, etc. Consolidated organization plans expansion program for increased output. Carmi H. Thompson will be president.

Lycoming Mfg. Co., Williamsport, Pa., Manufacturer of automobile engines, parts, etc., a subsidiary of Auburn Automobile Co., Auburn, Ind., has awarded general contract to Austin Co., 1015 Chestnut Street, Philadelphia, and Cleveland, for two-story addition on Park Avenue, reported to cost about $90,000 with equipment. It is understood that erection will be carried out by Fell Co., William Street, Williamsport.

Delaware Electric Power Co., Wilmington, Del., is carrying out an expansion and improvement program in power plants and system to cost more than $1,000,000, providing for increased generating and transmission line facilities.

Board of Trustees, Benton School District, Benton, Pa., is having plans drawn for a one-story manual training shop in connection with new gymnasium. W. Walter Witman, 1916 Market Street, Harrisburg, Pa., is architect.

New England

BOSTON, Aug. 27.—Compared with June and July, August will be a lean month for a majority of New England machine tool dealers and manufacturers but will compare favorably with August, 1928. Manufacturers have sufficient backlogs, in a majority of instances, to keep plants running on current operating hours during the remainder of 1929, and quite a few well into 1930. The only important sale reported the past week by local dealers was more than a dozen milling machines to a Connecticut manufacturer.

Eastern Aircraft Corporation, Pawtucket, R. I., recently organized to manufacture all-metal aircraft, is establishing new plant near What Cheer airport, and will specialize in production of seven and three-passenger cabin type planes from designs and patents of Bayerische Flugzeugwerke, A. G., Augsburg, Germany, for which American rights have been secured. Company has arranged for stock issue to total $875,000, portion of fund to be used for plant facilities and operations. Ray C. Van Arsdale is president; Alexander Klemin is consulting engineer.

Superior Spring & Mfg. Co., 373 Washington Street, Hartford, Conn., with headquarters at New Haven, Conn., has acquired property at 397 Washington Street, 60 x 150 ft., as site for new plant, reported to cost more than $45,000 with equipment.

Union Twist Drill Co., 70 Monroe Street, Athol, Mass., has plans for a two-story addition, 60 x 100 ft., reported to cost close to $45,000 with equipment.

Federal Electric Co., 8700 South State Street, Chicago, has concluded arrangements for purchase of Loper Fire Alarm Co., Stonington, Conn., manufacturer of wireless fire alarm systems and devices, and will consolidate with organization. It is proposed to remove Stonington plant to Chicago, where production will be concentrated and increased. A. P. Loper, heretofore head of acquired company, will continue with organization as consulting engineer.

Yale & Towne Mfg. Co., Stamford, Conn., locks, etc., is building a one-story, 100 x 150 ft. unit No. 19 and foundry addition.

South Atlantic

BALTIMORE, Aug. 27.—Western Electric Co., 195 Broadway, New York, has approved plans for a one-story power house at new cable and telephone equipment manufacturing plant at River View Park, Baltimore, now in course of construction, to cost about $150,000 with equipment. Entire project will cost more than $10,000,000. H. K. Ferguson Co., Hanna Building, Cleveland, is engineer.

Excelsior Pearl Works, Inc., 131 Ingraham Street, Brooklyn, N. Y., manufacturer of buttons, has purchased property at Federalsburg, Md., and plans early erection of one-story factory, totaling about 30,000 sq. ft. floor space, reported to cost about $70,000 with equipment. Company is now operating three plants and plans removal of branches to new location, with later concentration of all production at that location, following building of other units.

Sylvania Industrial Corporation, 122 East Forty-second Street, New York, has awarded general contract to Hughes-Foulkrod Co., Schaff Building, Philadelphia, for initial units of proposed mill for manufacture of transparent paper products at Fredericksburg, Va., to include a machine shop and boiler plant, estimated to cost $750,000 with equipment. Ballinger Co., Twelfth and Chestnut Streets, Philadelphia, is architect and engineer.

Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, has filed plans for seven-story equipment storage and distributing plant, 86 x 140 ft., at 416-30 South Eutaw Street, to include mechanical repair and service shop, estimated to cost $170,000 with equipment.

Coastal Public Service Co., Guyton, Ga., is planning extensions and improvements in local electric light and power plant, including installation of generator unit, crude oil engine and auxiliaries, reported to cost more than $100,000.

City Council, Griffin, Ga., is planning for bids early next month for pumping machinery and auxiliary power equipment, pipe lines, etc., for a municipal waterworks, to develop capacity of 3,000,000 gal. a day, estimated to cost about $275,000. Robert & Co., Bona Allen Building, Atlanta, Ga., are engineers.

Norfolk & Western Railway Co., Norfolk, Va., plans installation of elevating, conveying and other mechanical-handling equipment at new warehouses and dis-

tributing plants at Lambert's Point, consisting of two units, 120 x 500 ft., and 120 x 800 ft., estimated to cost $260,000. General contract has been let to John P. Pettyjohn, 212 Eighth Street, Lynchburg, Va. W. P. Wiltsee is chief engineer.

Virginia Public Service Co., Charlottesville, Va., has acquired plant and property of Leesburg Electric Co., Leesburg, Va., and will consolidate with organization. Plans are under way for extensions and improvements in Leesburg plant, with installation of additional equipment for increased output; additions will be made in transmission lines.

Detroit

DETROIT, Aug. 27.—Western Gear Co., 3428 Scotten Street, Detroit, has arranged for a division of operations, including general manufacture of new gears and transmissions for automobile service, and formation of subsidiary organization to take over replacement branch of business. New building has been leased and will be used to more than double former capacity. Arrangements have been made for a heat-treating plant to occupy a separate unit.

Ford Motor Co., Detroit and Dearborn, Mich., is having plans completed for new power plant on Oakman Boulevard, near Ford airport, Dearborn, reported to cost in excess of $150,000 with equipment. Albert Kahn, Inc., Marquette Building, Detroit, is architect and engineer.

Covel Mfg. Co., Benton Harbor, Mich., manufacturer of saw-filing machinery and kindred mechanical equipment, has awarded general contract to M. W. Stock & Sons, Broad Street, St. Joseph, Mich., for one-story addition on Graham Avenue, estimated to cost about $40,000 with equipment.

Board of Water Commissioners, 735 Randolph Street, Detroit, is asking bids until September 11, for equipment for municipal waterworks at Springwells Station, including two 1000-hp. steam boiler units with complete accessories, two superheaters for boilers, two underfeed stokers for boilers, two economizers and two air preheaters. Specifications on file at Department of Water Supply, Division of Engineering, 8100 West Warren Avenue, Dearborn, Detroit; George H. Kenkell is general manager and chief engineer.

Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Street, Detroit, manufacturer of precision tools, Diesel engine parts, etc., has filed plans for addition to plant to increase present floor space by more than 150 per cent, reported to cost more than $150,000 with equipment. Portion of new unit will be used for production of line of new specialties, including new precision equipment and parts for airplane motors. N. A. Woodworth is president.

Central Machine Co., 6320 East Fort Street, Detroit, is planning two-story addition to machine shop, 60 x 100 ft., to cost about $45,000 with equipment.

Wayne County Board of Supervisors, Barlum Tower Building, Cadillac Square, Detroit, will soon take bids for aircraft hangar at county airport, Middlebelt and Goddard Roads, with repair and reconditioning shop facilities, estimated to cost more than $300,000 with equipment. Plans are also under way for one-story power plant at same location to cost in excess of $85,000. B. Russell Shaw, Arcade Building, St. Louis, is architect and engineer for both projects.

Department of Water and Electric Light, 116 West Ottawa Street, Lansing, Mich., has awarded general contract to H. G. Christman Co., Lansing, for addition to municipal electric light and power plant at Moores River Park, to cost about $750,000 with machinery. J. E. Woodwell, 501 Fifth Avenue, New York, is consulting engineer.

Pittsburgh

PITTSBURGH, Aug. 27.—Westinghouse Electric & Mfg. Co. is reported to be buying freely against its third quarter machine tool list. The report of most dealers is that business still is good, although typical of this time of the year, the absence on vacations, of those in charge of purchases, means that the actual placing of orders is delayed. With the awarding of the cranes for the steel works at the McKeesport works, National Tube Co., it is believed the machine tool requirements are nearer consideration.

Standard Steel Specialty Co., Beaver Falls, Pa., manufacturer of machine keys and other mechanical products, has plans for one-story addition, 60 x 120 ft., to plant at West Mayfield, reported to cost about $75,000 with equipment.

Fokker Aircraft Corporation of America, Inc., Glendale, near Wheeling, W. Va., is projecting plans for two new branch plants, one to be located in vicinity of San Francisco, for parts production and assembling, and other at McCook Field, Dayton, Ohio, recently acquired, both works reported to cost more than $200,000.

Youghiogheny & Ohio Coal Co., of Pennsylvania, Inc., Commonwealth Building, Pittsburgh, operating bituminous coal mining properties in western Pennsylvania, has arranged for a bond issue of $2,000,000, portion of fund to be used for extensions and improvements in plants for increased capacity.

West Virginia Airways, Inc., Charleston, W. Va., recently organized by Harold B. Shadle, Edgewood Drive, and associates with capital of $100,000, plans establishment of flying school and commercial flying facilities at municipal airport, including repair and reconditioning shops, airplane accessory shop, and other units, reported to cost over $60,000.

Hale Aeroplane & Motor Vehicle Mfg. Co., Welch, W. Va., has been organized with capital stock of $50,000 to manufacture airplanes. Company is contemplating construction of plant. William Hale is president.

Buffalo

BUFFALO, Aug. 27.—Consolidated Aircraft Corporation, 2050 Elmwood Avenue, Buffalo, has acquired tract of 30 acres of land near municipal airport, Long Beach, Cal., and plans new plant for Pacific Coast trade, one-story, including parts and assembling divisions, reported to cost more than $100,000 with equipment. Company recently secured a substantial interest in Kinner Airplane & Motor Corporation, Glendale, Cal., manufacturer of aircraft motors, and which will be used in airplanes to be built by company at projected plant.

Cutler Desk Co., 20 Churchill Street, Buffalo, manufacturer of metal and wood office furniture, has awarded general contract to B. Rebascher & Sons, Inc., 110 Timon Street, for extensions and improvements in factory to cost about $30,000.

Morrison Steel Products Co., 201 Urban Street, Buffalo, manufacturer of automobile parts and equipment, has filed plans for one-story plant at 127 Kehr Street, to cost close to $30,000 with equipment.

Vernon E. Cook, 724 North Washington Street, and Leo R. H. Burton, 109 West Garden Street, Rome, N. Y., have organized new company under name of Burton, Cook & Co., and plan operation of local plant for manufacture of machinery and mechanical equipment.

Simmons Co., 420 Canal Street, Syracuse, N. Y., manufacturer of brass and other metal bedsteads, springs, etc., with main works at Kenosha, Wis., has asked bids on general contract for new three-story branch plant and distributing works at Sizer Street and Raynor Avenue, reported to cost over $85,000 with equipment. Paul Hueber, 212 Harrison Street, is architect.

Irving Air Chute Co., 372 Pearl Street, Buffalo, manufacturer of aviation equipment, is said to be arranging for early operation of new branch plant at Los Angeles, to cost more than $75,000 with equipment. New unit will be used for manufacturing for Pacific Coast trade.

Cleveland

CLEVELAND, Aug. 27.—Machine tool sales continue to taper off. Starting with a fair volume of business at the first of the month there has been a rather steady decline in orders from week to week. Buying the past week was limited for the most part to single tools for replacement purposes. Detroit reports a quiet market as the motor car industry is buying little equipment at present. While some machine tool manufacturers have caught up a little on shipments of tools in some sizes, the general delivery situation shows little improvement and some business is not being placed because prospective purchasers cannot secure fairly prompt deliveries.

Dill Mfg. Co., 684 East Eighty-second Street, Cleveland, manufacturer of automobile tire valves, valve fittings, steering locks, etc., is said to be planning new one-story addition on Mandalay Road, to cost in excess of $40,000 with equipment. J. D. Williamson is president.

Cleveland Universal Jig Co., 2005 Rockwell Avenue, Cleveland, has awarded general contract to Ellsasser Construction Co., 1517 Prospect Avenue, for one and two-story plant unit on St. Clair Avenue, reported to cost close to $40,000 with equipment. Kalsch & Hoeffler, 4500 Euclid Avenue, are architects and engineers.

Boom Boiler & Welding Co., 2313 Elm Street, Cleveland, has taken over the plant and business of Blackwell Welding Co., Toledo, Ohio, and will continue operations as a branch. W. J. Heller will be manager.

Linderme Tube Co., 1291 East Fifty-third Street, Cleveland, manufacturer of steel tubing, etc., has plans under way for one-story addition, 60 x 100 ft., to cost close to $50,000 with equipment. Emil Linderme is president.

Newburgh Steel Co., 6318 Kinsman Road, Cleveland, will soon take bids for a one and two-story addition on Tullamore Road, reported to cost more than $70,000 with equipment. George S. Rider Co., Century Building, is architect and engineer.

General Fireproofing Co., Youngstown, Ohio, has work under way on new addition to cost about $100,000 and will equip for production of aluminum chairs for office service and kindred furniture. Unit is scheduled to be ready for occupancy in November.

Bruce-Macbeth Engine Co., 2111 Center Street, Cleveland, manufacturer of gas engines, parts, etc., is reported planning one-story addition to cost in excess of $45,000 with equipment. C. E. Curtis is general manager.

Middle States Air Service, Inc., Akron, Ohio, care of C. W. Frank, Akron Savings & Loan Building, architect, has plans under way for hangar at Fulton Field, with repair and reconditioning shop facilities, estimated to cost $80,000 with equipment.

Chicago

CHICAGO, Aug. 27.—Purchases of machine tools for the "Farmall" tractor plant of the International Harvester Co. at Rock Island, Ill., may be completed this week. Outside of this list there are no large inquiries in the market. Business is at about the same rate as in July, but somewhat smaller than in earlier months of the year. Demand is well diversified and is generally of a hand-to-mouth character, since prompt delivery is commonly asked. In fact, some buyers, notably the smaller ones, are withdrawing inquiries because of the delayed shipments on many types of machine tools. Deliveries on most classes of tools range from 10 to 12 weeks, and in extreme instances manufacturers will not promise shipments before January or February. Chicago, Burlington & Quincy is in the market for two axle lathes.

Illinois Anthracite Corporation, 307 North Michigan Avenue, Chicago, has awarded contract for seven-story electric transformer building, 47 x 84 ft., to cost $20,500.

Crane Co., 936 South Michigan Boulevard, Chicago, placed contract for one-story plant addition, 120 x 220 ft., at 4100 South Kedzie Avenue, to cost $110,000.

Iver Larsen & Sons, pattern makers, 165 North Jefferson Street, Chicago, sustained damage to their plant recently by fire.

E. A. Wheeler and William F. Walker have opened a machine shop at 330 Wabash Avenue, Decatur, Ill.

Anaconda Wire & Cable Co., Sycamore Ill., will install wire-drawing machines and electric annealing ovens in its plants and expects to require 100 to 150 additional employees.

Cook Electric Co., 2700 Southport Avenue, Chicago, has acquired from Teletype Corporation property 123 x 232 ft., at 2731 High Street, improved with a one and two-story plant and office building and a one-story warehouse.

General Porcelain Enameling Co., 4100 Schubert Avenue, Chicago, has awarded contract for a one-story factory, 26 x 125 ft., to cost $3,000.

Wolverine Carburetor Co. of Michigan, manufacturer of carbureters, has taken possession of factory formerly occupied by the J. C. Mfg. Co. at Jackson, Mich.

Chicago, Rock Island & Pacific Railroad Co., La Salle Street Station, Chicago, has filed plans for addition to engine house, 20 x 300 ft., with repair facilities, at 4701 Wentworth Avenue, to cost about $45,000 with equipment. A. T. Hawk is company architect.

The Crane Market

INQUIRY for locomotive cranes is increasing with some good business in prospect for export and a fair volume of inquiry from contractors. The Amtorg Trading Corporation, New York, is taking bids on two 20-ton and one 15-ton locomotive cranes for export to Russia and Japanese trading companies in New York are in the market for a locomotive crane for Japan. In the domestic field, the New York Central Railroad is inquiring for a 25-ton locomotive crane. In the New York district, the Brooklyn Edison Co., is in the market for a 75-ton trolley for a Case overhead crane in a sub-station. The United States Metals Refining Co., Carteret, N. J., is about to close on seven 15-ton electric traveling cranes for Copper Cliffs, Canada. Low bidder on the sub-stations to be erected for the Board of Transportation, New York, which will require six 30-ton electric cranes was the Erickson Engineering Co., New York.

It is rather generally conceded in the Pittsburgh district that this year has been the best since the war. Most builders have sufficient orders to insure full operation to the end of the year. The National Tube Co., which recently bought 24 cranes for McKeesport, Pa., will shortly buy a number for the new seamless tube mill. Cranes have also been placed by the Wheeling Steel Corporation and the Corrigan, McKinney Steel Co.

Among recent purchases are:

Arizona Edison Co., Casa Grande, Ariz., 10-ton 50-ft. span hand power crane from Box Crane & Hoist Corporation.

De Laval Cream Separator Co., Poughkeepsie, N. Y., two 2-ton, 23-ft. and 28-ft. spans, 3-motor overhead cranes and seven 1-ton, 23-ft. span hand power cranes with electric hoists from Shepard Niles Crane & Hoist Corporation.

Wright Aeronautical Corporation, Paterson, N. J., 2-ton hand power crane from Box Crane & Hoist Corporation.

Temple Corporation, 1925 South Western Avenue, Chicago, manufacturer of all-electric radio equipment and devices, has purchased property at West Sixty-fifth Street and La Vergne Avenue, as site for new plant which will more than triple present capacity. Existing plant will be removed to new location as soon as unit is ready. Project is estimated to cost more than $400,000 with equipment. Foltz & Co., 510 North Dearborn Street, are architects.

Mid-West Bottle Cap Co., Belvidere, Ill., manufacturer of metal bottle caps, etc., has asked bids on general contract for one and one-half story addition, reported to cost about $30,000 with equipment. Bradley & Bradley, Brown Building, Rockford, Ill., are architects.

Iowa-Nebraska Light & Power Co., Lincoln, Neb., has approved plans for addition to steam-operated electric power plant at Shenandoah, Iowa, 53 x 75 ft., reported to cost in excess of $100,000 with equipment.

Chicago & Northwestern Railways Co., 400 West Madison Street, Chicago, has awarded contract to G. A. Johnson & Sons, 730 Rush Street, for addition to engine house, with repair facilities, at Council Bluffs, Iowa, reported to cost about $40,000 with equipment.

Sundstrand Machine Tool Co., Rockford, Ill., manufacturer of machine tools, has disposed of a stock issue of 63,250 shares, portion of proceeds to be used for expansion. Hugo L. Olson is president.

McQuay Radiator Corporation, 1600 Broadway, N. E., Minneapolis, Minn., manufacturer of unit heaters for industrial service, is completing erection of new two-story and basement plant unit, and plans early installation of equipment. Expansion will cost in excess of $50,000. Perry E. Crosier, New York Life Building, is architect.

George D. Whitcomb Locomotive Works, Rochelle, Ill., is erecting plant addition, 52 x 63 ft., at cost of $15,000.

Milwaukee

MILWAUKEE, Aug. 27.—Whatever decline there may have been recently in orders for machine tools or other metalworking equipment has hardly been perceptible locally. Deliveries have not improved in the slightest up to this time, although some manufacturers through increased manufacturing facilities or increased factory efficiency expect to hasten deliveries. Some dealers say that a considerable share of their August volume may be attributed to the closing of business during August which had been pending in July and even in June. Demand now is greatest from agricultural implement factories at Milwaukee, Racine and Madison, from commercial truck manufacturers and from manufacturers of electrical equipment both for public utilities and private industrial plants. Demand from passenger automobile manufacturers and railroads is at low ebb.

Rundle Mfg. Co., Milwaukee, manufacturer of enameled iron ware and bathroom equipment will triple its output through the construction and equipment of a new plant, ground for which is now broken at Camden, N. J., with adjoining deep water wharfage on the Delaware River. Financing of the new factory has been arranged by an issue of $1,000,000 first mortgage 6 per cent bonds. At least 80 per cent of the company's output during the life of the issue is contracted to Sears, Roebuck & Co., according to the company's statement in the bond issue circulars. The new Camden plant will be only one story high but will contain 240,000 sq. ft. Henry Held is president and H. J. Held, secretary and general superintendent, both at Milwaukee. A. C. Held is treasurer, vice-president and general manager at Camden.

Control of Milwaukee Air Power Pump, 10 Keefe Avenue, Milwaukee, has passed from John R. Ball, late president and treasurer, to Julius P. Heil, president of the Heil Co., Milwaukee, manufacturer of steel tanks and dump bodies, but the Heil Co. is in no way concerned. The pump concern manufactures forced water systems and oil burning appliances for domestic or industrial uses. Under Julius Heil as the newly named president, his son, Joseph F. Heil, treasurer, Homer S. Rogers, continuing as vice-president, and F. W. Richert, as secretary, the concern will install additional equipment in the present building and seek national distribution for all its products.

Smith Engineering Works, 78 Capitol Drive, Milwaukee, has begun construction of one story plant addition, 90 x 150 ft., at about $75,000 cost, to increase production in the rock crusher department. A new portable type of rock crusher will be introduced. Charles F. Smith is president and general manager.

Wisconsin Ornamental Iron & Bronze Co., 1665 Booth Street, Milwaukee, manufacturer of bronze products used in build-

ing construction, following its recent merger with the General Bronze Co., Long Island City, N. Y., will double its output through the construction of additions on which work has not yet been started. E. A. Ernst, president of the Wisconsin company will remain in charge at Milwaukee.

Michigan College of Mining and Technology, Houghton, Mich., has selected Derrick Hubert, Menominee, Mich., as architect for $300,000 mechanical engineering building, plans scheduled to be ready late in September or early in October. R. R. Seeber is dean of college of mechanical engineering.

Tank Aero Corporation, 271 First Avenue, Milwaukee, plans two-story addition, 100 x 150 ft., or will lease equivalent space for production of a new design of air-cooled V-type, 8-cylinder, 125 h. p. aircraft engine already tested in flights and which will supplement present production of 42 water cooled airplane engines monthly. New machinery valued at $60,000 has already been installed in the Tank plant and the Milwaukee Parts Co., manufacturers of automotive and aircraft parts has been merged with the concern. A. J. Tank is chief engineer, general manager and vice-president.

Wisconsin-Timken Axle Co., Oshkosh, Wis., has broken ground for one-story, 40 x 132 ft., addition to heat treating plant to cost about $30,000. An addition to the machine shop is being completed. The Wisconsin plant produces double reduction drive axles for buses and trucks besides axles for railroad gas or oil-driven coaches.

State Industrial School for Girls, Oregon, Wis., will construct $20,000 water works improvements including 100,000 gal. storage reservoir, 10,000 gal. receiving reservoir, air compressor, air lift, motor and steam-driven centrifugal pumps, sewer and water mains, manholes, hydrants and valves. School is under the jurisdiction of the State Board of Control, A. W. Bayley, secretary.

Eggers Veneer Seating Co., Two Rivers, Wis., has let contracts for construction of additions to cost about $75,000.

Cincinnati

CINCINNATI, Aug. 27.—Demand for machine tools shows a slight seasonal recession, affording district manufacturers further opportunity to cut into their large amount of unfilled orders. Fresh bookings are still greater than those of a year ago, and the number of small inquiries indicates that business for the remainder of this year will continue at a high level. The demand continues to be well diversified and is for both replacements and new equipment, but orders rarely call for more than two machines. An Eastern manufacturer placed an order with a local builder of planers for two large tools.

Andrews Steel Co., Newport, Ky., has awarded general contract to D. Meinken & Son, 2143 Bernard Avenue, Cincinnati, for two-story addition, to be equipped primarily for laboratory service, reported to cost about $40,000. Tietig & Lee, 34 West Sixth Street, Cincinnati, are architects.

Tennessee Eastman Corporation, Kingsport, Tenn., has approved plans for steam-operated electric power plant at local chemical works, reported to cost more than $150,000 with equipment, in connection with a general expansion and improvement program to cost more than $1,500,000. Baker & Spencer, 17 Battery Place, New York, are engineers for power station.

United States Foil Co., Grand and Thirtieth Streets, Louisville, manufacturer of tin foil, etc., has plans under way for two-story plant, 100 x 200 ft., on Hall Avenue, for production of tin, aluminum and lead foils, reported to cost close to $70,000 with equipment.

Holston River Power Co., Kingsport, Tenn., has secured Federal permission for construction of power dams on Holston and Watauga Rivers for a hydroelectric power project to develop a capacity of 74,000 hp. It will include transmission system and is reported to cost more than $1,500,000. Company is affiliated with American Cyanamid Co., 535 Fifth Avenue, New York.

St. Louis

ST. LOUIS, Aug. 27.—Elmore Centrifugal Products Corporation, 6527 Manchester Avenue, St. Louis, has been incorporated with capital of $150,000 to take over business of G. H. Elmore, Philadelphia, manufacturing Elmore continuous centrifugal dryer. A solid bowl type machine, which separates liquids from solids by a continuous process is being developed. A testing laboratory and offices have been established at above address, but temporarily the machine will be manufactured on contract. Harry Scullin, president Scullin Steel Co., is chairman of executive committee. G. H. Elmore is president and A. L. Sautter secretary and treasurer.

Multiplex Display Fixture Co., 918 North Tenth Street, St. Louis, has asked bids on general contract for two-story and basement addition, 96 x 105 ft., reported to cost about $40,000 with equipment. Otto J. Krieg, Wainwright Building, is architect.

Board of Education, Lyons, Kan., is considering installation of manual training equipment in new two-story and basement senior high school, estimated to cost $180,000, for which bids are being received on general contract. Mann & Co., Rorabaugh-Wiley Building, Hutchinson, Kan., are architects.

Black Servant Mfg. Co., 2951 North Market Street, St. Louis, William F. Brinkman, president, manufacturer of underfeed stokers for power plant service, has acquired building and will establish new plant, including departments for parts production and assembling, reported to cost in excess of $75,000 with equipment.

Indiana

INDIANAPOLIS, Aug. 27.—Inca Mfg. Corporation, Fort Wayne, Ind., recently organized to manufacture magnet wire, windings and electrical specialties for the automotive, radio and electrical industries, has awarded general contract to Buesching-Hagerman & Co., local, for plant, 200 x 300 ft., on New Haven Avenue. Company is in market for materials and equipment for plant, which will begin operations in October. George W. Spindler is secretary and treasurer.

Wandtke Pattern & Foundry Co., Inc., 1700 Ohio Avenue, Anderson, Ind., has been incorporated for $25,000 to manufacture wood and metal patterns and brass, bronze and aluminum castings. Company is now conducting jobbing foundry in new plant at above address. H. J. Wandtke is president.

Mid-states Steel & Wire Co., Oak Street, Crawfordsville, Ind., is said to be considering new one-story addition to cost over $40,000 with equipment. E. J. Sommer is general manager.

Borg-Warner Corporation, Muncie, Ind., manufacturer of automobile brakes, gears, and kindred products, has concluded arrangements for purchase of Norge Corporation, 670 East Woodbridge Street, Detroit, manufacturer of electric refrigerating equipment, and its affiliated interest, Detroit Gear & Machine Co., same address. Acquiring company will continue operations at present location and plans expansion program for larger output.

Davis Foundry Co., Newcastle, Ind., manufacturer of grey iron castings, plans rebuilding of portion of foundry destroyed by fire, Aug. 17, with loss estimated at $45,000, including equipment.

Merger plans have been perfected by Buescher Band Instrument Co., and C. G. Conn, Ltd., manufacturer of brass musical instruments, both of Elkhart, Ind., and Leedy Mfg. Co., 1033 East Palmer Street, Indianapolis, manufacturer of similar instruments. Companies will retain present identities and plants will continue at existing locations, with expansion in different divisions for enlarged output.

Pacific Coast

SAN FRANCISCO, Aug. 27.—Marchant Calculating Machine Co., Emeryville, Cal., manufacturer of computing machines and parts, has awarded general contract to W. C. Keating, Central Bank Building, Oakland, Cal., for one and two-story addition to cost about $60,000 with equipment. Miller & Warnecke, 1404 Franklin Street, Oakland, are architects.

Burgess Aeronautical & Engineering Corporation, 128 Santa Monica Boulevard, Santa Monica, Cal., is planning new local plant for manufacture of special aircraft of amphibian type, with rotary valve engines and accessories, consisting of one-story units, reported to cost in excess of $70,000 with equipment.

Wise Mfg. Co., Berkeley, Cal., manufacturer of mechanical equipment, has concluded arrangements for purchase of Standard Die & Tool Co., Oakland, Cal., and will consolidate with organization. It is proposed to continue Standard plant at present location and carry out expansion program for increased capacity.

Board of Education, San Francisco, will soon take bids on general contract for addition to junior high school at Francisco, Powell and Stockton Streets, to include group of six machine shops for manual training service, estimated to cost $400,000. S. Heiman, 57 Post Street, is architect; Coddington & Duncan, 222 Kearny Street, are the engineers in charge.

Puget Sound Power & Light Co., Seattle, has made application for permission to use water from Lake Washington, near site of proposed new steam-operated electric generating plant for service for that station, estimated to cost $7,000,000, including steel tower transmission line for connection with system at Seattle and other points.

Pacific Electric Railway Co., Pacific Electric Building, Los Angeles, has plans under way for a new terminal at Long Beach, to include group of repair and mechanical shops for electric car service, car house and other traction units, with service, repair and garage building for motor coaches. Entire project will cost

in excess of $250,000. Engineering department of company is in charge.

Pacific Gas & Electric Co., 245 Market Street, San Francisco, has filed plans for an equipment storage and distributing plant on block bounded by Shotwell, Folsom, Eighteenth and Nineteenth Streets, including meter repair and mechanical division, with automobile service, repair and garage unit, and other shops, reported to cost more than $500,000 with equipment.

Day & Night Water Heater Co., Monrovia, Cal., manufacturer of water heaters for domestic service, parts, etc., is having plans drawn for a one-story addition to cost about $35,000 with equipment. A traveling crane will be installed. Hamm, Grant & Bruner, Inc., Ferguson Building, Los Angeles, is architect and engineer.

Gulf States

BIRMINGHAM, Aug. 27.—Central Power & Light Co., Frost Bank Building, San Antonio, Tex., operated by Central & South West Utilities Co., Dallas, Tex., is said to be planning new steam-operated electric light and power plant in vicinity of Laredo, Tex., with initial capacity of about 30,000 kw. Project will include transmission line to connect with main system of company, and it is reported will cost in excess of $400,000.

P. H. Schindler Machine Works, 423 Poydras Street, New Orleans, La., has leased a one-story building at 623 Peters Street, and will establish a new machine shop at that location.

City Council, Delray, Fla., will receive bids until Sept. 16 for equipment for municipal waterworks, including one engine-driven centrifugal pumping unit and four motor-driven centrifugal pumps, with accessory equipment. Main Engineering Co., 112 Marion Street, Daytona Beach, Fla., is engineer.

Canada

TORONTO, ONT., Aug. 27.—Ratepayers of Simcoe, Ont., have passed a by-law granting a fixed assessment to the American Can Co. of $200,000 for 10 years. Company recently purchased the can plant of the Canadian Canners and two blocks of land at Simcoe. It is the intention of the company to start work immediately on the erection of a plant to cost $1,000,000.

Ferranti Electric Co., Ltd., 26 Noble Street, Toronto, has awarded general contract to Thomson Brothers, Toronto, for the erection of manufacturing plant at Mount Dennis, Ont., to cost $250,000. Reid & Brown Structural Steel & Iron Works, Toronto, has the steel contract.

Canadian Steel Foundries, Ltd., has awarded contract to John MacGregor, Ltd., 1410 Stanley Street, for the erection of a two-story plant addition at Longue Pointe, Que., to cost $75,000.

Canadian National Railways will erect car shops at Truro, N. S., to be 40 x 180 ft. Construction work will be carried out by company bridge and building departments. R. U. Appleton is general manager of Atlantic region.

McKinnon Industries division of General Motors of Canada, St. Catharines, Ont., will award contracts immediately for the erection of a $175,000 addition to plant, it was announced by H. J. Carmichael, president of McKinnon Industries.

Dominion Bridge Co., 1139 Shaw Street, Toronto, Ont., has purchased a site at Mount Dennis, Ont., where it will erect a plant to cost $1,500,000. Construction work to be started next spring.

Beauharnois Electric Co., 107 Craig Street West, Montreal, has awarded contract to the Beauharnois Construction Co., 112 St. Lawrence Street, for the construction of canal and power development plant at Beauharnois to cost $65,000,000. Preliminary work will be started at once and it is expected to have the plant completed in 1932. Consulting engineer is Fred Brown, 117 St. Catharine Street West, Montreal.

Western Canada

Dominion Bridge Co., Calgary, Alta., has permit to erect a plant at 801 Twenty-fourth Street, to cost $89,000.

City council, Calgary, Alta., intends to spend $2,000,000 to $3,000,000 on waterworks plant and system.

Canadian Industries, Ltd., 611 Paris Building, Winnipeg, Man., has purchased site at East Selkirk, Man., and will start work immediately on the erection of a plant for the manufacture of explosives, etc.

Western Foundries, Ltd., Lethbridge, Alta., is planning to build a plant to cost $25,000. Two buildings will be erected, one 48 x 80 ft. and the other 60 x 115 ft. Equipment and tools will be purchased.

The Radio Industries of Canada, Ltd., Winnipeg, Man., has established headquarters at Calgary, Alta., and intends to erect $30,000 manufacturing plant.

Seaboard Oil Refining Co., Vancouver, B. C., has been incorporated with a capital stock of $2,000,000. Company will immediately proceed with the erection of an oil refinery. David B. Boyd, Standard Bank Building, is local manager for the company.

Foreign

ELECTRICAL Administration, Soviet Russian Government, Moscow, is arranging an appropriation of 415,000,000 rubles (about $207,500,000) for power plant construction during fiscal year 1929-30, starting Oct. 1, to include 10 new central generating plants comprising station at Malaya Vishera, with capacity of 132,000 kw.; at Bobrikov, 150,000 kw.; Uzh, 150,000 kw.; Samara, 22,000 kw.; Kuznetz, Siberia, 44,000 kw., all of hydroelectric generating type; with steam-electric generating stations at Moscow and Leningrad, with capacities of 75,000 kw. and 30,000 kw. respectively. From fund noted, 42,000,000 rubles (about $21,000,000) will be used for work on Dnieper River hydroelectric power project during fiscal year, work on which is now under way and which is scheduled for completion in October; this station will have a capacity of 800,000 hp., divided into 10 turbo-generator units. Hugh L. Cooper, 101 Park Avenue, New York, is consulting engineer for last-noted project. Amtorg Trading Corporation, 261 Fifth Avenue, New York, is official buying agency for Soviet Union.

International General Electric Co., Schenectady, N. Y., subsidiary of General Electric Co., in cooperation with International Pirelli Co., Ltd., Brussels, Belgium, an interest of Pirelli Co., Milan, Italy, has concluded arrangements for purchase of controlling interest in National Copper Mfg. Co., Rio de Janeiro, Brazil, known as "Conac," manufacturer of electric wire, cables, etc. New owners plan immediate expansion in present plant, with installation of equipment for production of underground transmission cables, telephone wire, etc., reported to cost over $250,000.

Grigsby-Grunow Co., Ltd., subsidiary of Grigsby-Grunow Co., 2038 North Kolmar Avenue, Chicago, manufacturer of radio sets and equipment, has taken option on plant site at London, England, and will soon begin erection of multi-story unit, reported to cost over $350,000 with equipment. It is proposed to have plant ready for service by close of year. Bert J. Grigsby is president and general manager.

Soviet Russian Rubber Trust, Moscow, through Amtorg Trading Corporation, 261 Fifth Avenue, New York, has closed negotiations with Seiberling Rubber Co., Akron, Ohio, manufacturer of automobile tires and tubes, for technical assistance for new plant at Yaroslavi, to be equipped for initial capacity of 3100 automobile tires, 9000 bicycle tires and 480 motorcycle tires a day, reported to cost over $1,000,000 with equipment. Seiberling company will prepare plans for plant, supervise construction and operation. Machinery purchases will be made by Amtorg organization. M. Nickoforov, chairman of board of Rubber Trust, is now in United States to perfect final arrangements.

Compania Electrica de Santo Domingo, C. por A., Puerto Plata, Dominican Republic, West Indies, a subsidiary of Southern Cities Utilities Co., Fox Building, Philadelphia, has concluded arrangements for purchase of electric light and power properties, and waterworks of Dominican Republic, at Puerto Plata and Santiago. Plants and system will be consolidated under one management, including properties at La Vega, lately acquired by same interests. Expansion and improvements are planned for increased power facilities and transmission service.

Soviet Russian Government, Moscow, through Amtorg Trading Corporation, 261 Fifth Avenue, New York, official buying agency, is said to have awarded general contract to Austin Co., Euclid Avenue, Cleveland, for construction of plant at Nizhni-Novgorod for manufacture of Ford type automobiles and motor trucks, for which agreement for technical service was recently made with Ford Motor Co., Detroit. New plant will be equipped for annual production of 70,000 motor trucks and 30,000 automobiles, including parts and assembling, and is reported to cost more than $10,000,000 with machinery.

New Trade Publications

Locomotives With Internal Combustion Engine Drive.—George D. Whitcomb Co., Rochelle, Ill. The advantages, uses and economies effected by using locomotives powered with internal combustion engines are set forth in an eight-page pamphlet.

Casters and Trucks.—Service Caster & Truck Co., Albion, Mich. Catalog No. 29, containing 24 illustrated pages, gives the specifications of and describes the company's casters and trucks. A special page is devoted to information about how to measure a caster and what to call the parts.

Seamless Steel Tubes.—Globe Steel Tubes Co., 1345 Burnham Street, Milwaukee. Booklet of 24 pages, illustrating and describing the manufacture of seamless steel tubes. The tubes made by this company have special reference to the automotive industry and locomotive and merchant boilers.